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Emergency departments in the Netherlands

The influence of general practitioner cooperatives

For reasons of consistency within this thesis, some terms have been standardised throughout the text. As a consequence the text may differ in this respect from the articles that have been published.

The studies presented in this thesis have been performed at the Catharina Hospital in Eindhoven and at the Scientific Institute for Quality of Healthcare (IQ healthcare). IQ healthcare is part of the Radboud Institute for Health Sciences (RIHS), one of the research institutes of the Radboud University Nijmegen Medical Centre.

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Emergency departments in the Netherlands

The influence of general practitioner cooperatives

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Chapter 1

General introduction

This introduction is partly based on:

Maas M, Thijssen W, van der Heyden W, Rooijmans D, Klay N, van der Veen A.
SEH-arts biedt meerwaarde. *Medisch Contact* 2007;6:251-253.

Giesen P, Thijssen W, Voorn T. SEH kan efficiënter. *Medisch Contact* 2009;38:1590-1592.

This thesis concerns the changes in emergency care in the Netherlands with a focus on emergency departments (ED) and the effect of emergency-care-access Points (ECAP), in the literature also referred to as integrated GP cooperatives. This introduction will briefly describe the changes in emergency care over the previous two decades and their effect on emergency departments in the Netherlands. These changes have led to questions that will be addressed in this thesis.

Emergency care organisation

In the last two decades, emergency care in the Netherlands has changed dramatically. Around the year 2000, Dutch health care professionals raised concern about the quality of medical care provided in EDs.¹ Furthermore, the number of ED patient visits increased.² At the same time general practitioners (GPs) re-organised their after-hours care from small rota groups into large GP cooperatives (GPC).³ The latest change is the collaboration between EDs and GP cooperatives to form one emergency-care-access-point (ECAP) where triage decides if the patient is seen by the GP or referred to the ED.⁴

Emergency departments

Historically, EDs in the Netherlands were staffed with young inexperienced doctors and medical responsibility of EDs was hardly formalised.⁵ Supervision by medical specialists was mostly at a distance with the occasional visit of a medical specialist in the ED. Reports focused on quality of care in the "emergency care chain" pointed out the necessity to improve the system.^{6,7} As a consequence, several hospitals started to implement emergency medicine training schemes.^{8,9} The Royal Dutch Medical Association officially recognised this emergency medicine training scheme as of 1 January 2009.¹⁰ With emergency physicians now staffing the majority of Dutch EDs, the domain of emergency medicine is becoming more crystallised with focus on specific ED patient treatments, for example pain management, and specific ED procedures, for example reducing waiting times.^{11,12} Although the GP is considered the gatekeeper to hospital care in the Netherlands, patients can bypass that and present to the ED directly. The available literature on ED patient characteristics is either dated or represents a local situation. It shows that of all patients presenting to Dutch EDs, 44.3-84% of them are self-referrals, 16-36% are referred patients and 13% of patients are brought in by ambulance. Self-referred patients tended to be younger (average 33 years), with minor trauma, and infrequently required diagnostics (37%), treatment (49%) or admission (4%). The referred patients were older (average 50 years), with 41% needing admission.¹³⁻¹⁵

GP cooperatives

Since the beginning of 2000, GPs reorganised their after-hours care from small rota groups into large GP cooperatives. Currently, there are more than 130 GP cooperatives taking care of populations ranging from 100.000 to 500.000 citizens.¹⁶ The GP cooperative handles the majority

of all after-hours patient contacts (88%) and they refer around 5-7% to the ED.¹⁶⁻¹⁸ Most presented problems at the GP cooperative are acute infections and acute pain complaints.^{19,20} After establishing GP cooperatives, patient contacts increased with 4.6% at the GP cooperatives and decreased with 8.2% during office-hours and 8.9% after-hours at the ED.¹⁴

Collaboration between EDs and GP cooperatives

In the last decade, more GP cooperatives collaborate with EDs, forming One Emergency Care Access Point (ECAP). One of the motives for this reorganisation was redirecting the self-referred patient from the ED to the GP. This should reduce healthcare costs and length of stay (LOS) in EDs whilst maintaining the quality of care.^{21,22} More importantly, it would also help patients find the right entrance to emergency care since there is only one front door.

Objective and study aims

In the last decade several studies have looked at the changes of after-hours care with a focus on either GP cooperatives or self-referrals at the ED.^{4,14-17,23} With plans in the Netherlands, to increase the number of ECAPs, decreasing the number of EDs and specialising the remaining EDs into different levels of care, it is important to gain more insight into the characteristics of Dutch EDs and the effect of ECAPs on these characteristics. The objective of this thesis, therefore, was to describe the organisation and practice of Dutch emergency departments with a special focus on the effect of ECAPS. Gaining more insight into this is necessary to identify potential problems and opportunities for improving care, for instance shortening the length of stay, implementing fast tracks and develop emergency medicine guidelines for the overall emergency care chain.

In chapter **two** a narrative literature review describes the development and current structure of emergency medicine in the Netherlands, focusing mostly on emergency departments. A comprehensive search of published research and policy reports was performed, identifying 25 eligible papers, 7 reports and 2 PhD theses. The majority of research papers fell into two categories; the changes of patient characteristics after GP cooperatives and the implementation of EPs and their training programme. We addressed the development of emergency medicine, how EDs fit into the overall system of emergency care, what patients present to emergency departments, how the ED is staffed and finally the interaction between emergency physicians and both primary care and hospital specialists.

In the last decade several Dutch policy reports stated that quality of emergency care should be improved and that emergency physicians (EPs) play a large role in this quality improvement. The Netherlands Society of Emergency Physicians (NVSHA) has developed an emergency medicine training program, which is nationally recognised since 2009. Nevertheless, not all EDs are staffed with EPs. This study aimed to explore differences between Dutch EDs with EPs and those without EPs. Chapter **three** describes a cross sectional web-based survey exploring the differences in EDs

with and without emergency physicians, focussing on the number of emergency care courses physicians attended and the number of clinical audit activities EDs implemented. Questionnaires were sent, representing 101 out of a total of 105 EDs.

In most countries, different health care providers are involved in emergency care. In the Netherlands, out-of-hours care is provided by general practitioner cooperatives (GPCs) and emergency departments (EDs). The aim of the study described in chapter **four** was to explore the flow of patients attending emergency care services in the Netherlands, with a focus on care pathways (self-referred versus referred, admission versus (outpatient) follow-up), the role of estimated level of urgency (urgent versus non-urgent) and performed diagnostic tests. This was a retrospective observational study, using registration systems of one GPC and one ED in the Netherlands. We matched the GPC and ED contacts with electronic patient records at general practices. This study was conducted in one region with a co-located GPC and ED, which shared one entrance for all patients.

Chapter **five** describes a new model, emerging in the Netherlands, which is an Emergency Care Access Point (ECAP) for after-hours emergency care. This was a longitudinal observational study in an integrated after-hours care model (ECAP) between an urban emergency department (ED) and a general practitioner cooperative (GPC) in the South East region of the Netherlands, assessing the changes on emergency department (ED) utilisation and patient flows over a six year period.

In international, mostly American, literature there is a growing interest in ED crowding and its effect on length of stay (LOS) of the ED patient. Several factors have been associated with an increased LOS. The Netherlands has a different healthcare system with well-developed primary care, which increasingly collaborates with emergency departments. It was unclear how this influences crowding in emergency departments (EDs) of hospitals in the Netherlands. Chapter **six** describes an observational multicenter study of patient records of 7 EDs in the Netherlands providing insight into patient characteristics and care pathways and their association with length of stay, comparing ECAP EDs with non-ECAP EDs.

Since the GP is the gatekeeper at the ECAP and acuity and admission rates changed after implementation, we expected differences in patient characteristics, their presenting complaint and discharge diagnosis in ECAP EDs compared to non-ECAP EDs. This retrospective observational study of a patient sample from ED records of six emergency departments spread over the Netherlands, varying from urban EDs to large innercity EDs is described in chapter **seven**. This study aimed to gain insight into the characteristics of patients presenting at ECAP EDs compared to non-ECAP EDs, particularly their presented complaint and discharge diagnosis.

Research aims

	Chapter	Aims	Design
General ED characteristics	2	Gaining an overview of the development and current structure of emergency medicine in the Netherlands, focusing mostly on EDs	Narrative review
	3	Describing general features of all Dutch hospitals and EDs comparing EDs with and without emergency physicians	Cross sectional web-based survey
	4	Exploring the flow of patients attending EDs and GP cooperatives with a focus on diagnostics and care pathways	Comparative observational study
Influence of a GP cooperative on ED patient characteristics and flow of patients	5	Examining the change of an integrated GP cooperative (ECAP) on ED utilisation and planned patient follow-up.	Observational study
	6	Providing insight into patient characteristics and care pathways and their association with length of stay comparing ECAP EDs with non-ECAP EDs.	Multicenter observational study
	7	Studying the effect of an integrated GP cooperative (ECAP) on presenting complaints and discharge diagnosis of ED patients	Observational study

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Chapter 2

Emergency departments in the Netherlands

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ABSTRACT

Emergency medicine in the Netherlands is faced with an increasing interest by politicians and stakeholders in health care. This is due to crowding, increasing costs, criticism on the quality of emergency care, restructuring of out-of-hours services in primary care and the introduction of a training programme for emergency physicians in 2000. A comprehensive search was conducted of published research, policy reports and updated Dutch websites on acute care. Publications were included in this review if these referred to emergency care, including emergency departments (EDs), general practitioner (GP) cooperatives and emergency medical services in the Netherlands and were written in English or Dutch. The literature search identified 14 eligible papers. The manual search identified 11 additional papers. Seven reports and two PhD theses were also included. Given the lack of relevant empirical research, the review was liberal in its inclusion, but the analysis focused on research when available. EDs in the Netherlands are in different stages of development.

However, it is obvious that the presence of emergency physicians (EPs) is increasing and more EDs will be staffed by emergency physicians. Although this seems an important step, it does not necessarily imply a good position of the emergency physician in the EDs. What the characteristics of the future patient of the Dutch ED will be is dependent on the development of different ED levels of care and GP cooperatives. The lack of empirical research also points out the need for research on quality of care in Dutch EDs.

INTRODUCTION

Emergency medicine in the Netherlands is faced with an increasing interest by politicians and stakeholders in health care. This is due to crowding, increasing costs, criticism of the quality of emergency care, restructuring of out-of-hours services in primary care and the introduction of a training programme for emergency physicians in 2000. Emergency care in the Netherlands is currently provided by four healthcare providers: (1) Emergency departments (EDs), where patients can present on their own initiative (self-referrals), arrive after general practitioner (GP) referral or by ambulance. More EDs have been staffed with emergency physicians (EPs) since the start of an EP training programme. (2) GPs have reorganised out-of-hours primary care from small practices into large GP cooperatives. They have a telephone triage performed by nurses and GPs doing centre consults and home visits. In recent years, an increasing number of co-locations of GP cooperatives with EDs are seen. The most important aim of this co-location is to remove most of the self-referrals from the ED. (3) Ambulance services, which have also undergone a transition, changing from multiple small private organisations to large regional ones with a national training programme and implemented national guidelines. (4) The mental health service, which will not be discussed in this paper. In this review we aim to describe the development and current structure of emergency medicine in the Netherlands, focusing mostly on EDs. When possible we use empirical research, but as emergency medicine as an ED specialty is a recent development in the Netherlands, we have complemented this by experience-based knowledge.

METHODS

For this paper, we performed a comprehensive search of published research and policy reports. We searched Sumsearch, Cochrane library and Pubmed for relevant papers, which had to be published between 2000 up to 2010. We used the following medical subject headings: emergency care, emergency medicine, emergency medical services, emergency hospital service and the additional keywords: 'department', 'Dutch', 'Netherlands', 'patient', 'characteristics' and 'emergency care system'. We limited our search to papers published in English or Dutch. In addition, we performed a manual search in three Dutch journals (Nederlands tijdschrift voor Geneeskunde, Medisch Contact and Huisarts en Wetenschap). In February 2011 we searched on a continuously updated Dutch website on acute care (<http://www.acutezorg.nl/>). To make sure we had the most recent data, we also used official organisational websites. Finally, we selected national policy reports of the Ministry of Health, the Inspectorate of Health and the Netherlands Society of Emergency Medicine (NVSHA).

Publications were included in this review if these referred to emergency care, including EDs, GP cooperatives and emergency medical services in the Netherlands. Given the lack of relevant empirical research, we were liberal in our inclusion, but in our analysis we focused on research when available. A narrative review was made, focusing on the following themes: the

development of emergency medicine past, present and future; how the ED fits in the overall system of emergency care; which patients present to the ED and how it is staffed. We also looked at the interaction between the ED specialist with primary care specialists and hospital specialists.

RESULTS

The literature search identified 14 eligible papers. The manual search identified 11 additional papers. We also included seven reports and two PhD theses. The majority of the research papers fell into two categories: the changes of patient characteristics after GP cooperatives were founded, and about emergency physicians after the implementation of their training programme.

Development of emergency medicine: past, present and future

Emergency care in the Netherlands is referred to as the chain of acute care, although coordination between different providers is limited. Within this chain, EDs, GPs and ambulance services play a role.

Emergency departments

Historically, Dutch EDs were staffed by young, inexperienced physicians, who received supervision from a medical specialist who was not always physically present in the ED.^{1,2} In 1996 there was no medical head of staff in 65% of the EDs and no physician in the ED received specific training in emergency medicine. Only 12% of physicians in EDs had followed an advanced trauma life support course.³ The awareness of a lack of experienced doctors in EDs led to a cascade of changes in the Netherlands. In 1999 the NVSHA was founded and the first international conference organised; Emergency medicine: who cares?⁴ Also, in 1999, a small hospital in the east of the Netherlands started a 2-year training programme. This was followed by a 3-year training programme in 2000 by four major hospitals in different parts of the country. The young doctors who followed the training programme also developed it, together with a few medical specialists, mostly surgeons. They also received guidance from experienced American and Australian emergency physicians, who came to the Netherlands and worked as training directors in these hospitals.⁵

Because the NVSHA consisted mostly of young doctors and the development of emergency medicine needed more power, the Society for Training in Emergency Medicine (SOSG) was founded in 2004. This was initialised by the medical directors and medical specialists of four major hospitals. Their main goal was to come to a nationally recognised training programme for emergency medicine. This goal was supported by a report of the Inspectorate of Health in 2004 stating that the level of care provided in Dutch EDs was suboptimal.² In particular, it concluded that EDs had insufficient expertise in handling unstable patients, that the development of specialised trauma care was going too slowly and that there was an unacceptable variation of quality of care and access to EDs. In 2008 the training programme for emergency medicine was

recognised by the national board of medical specialists.⁴ However, at the present time emergency medicine continues to remain unrecognised as a specialty. At the end of 2009, 58.8% of Dutch EDs were staffed by at least one emergency physician. There are still many hospitals that do not work with emergency physicians and when they do, there is a wide variety in how the emergency physicians work and what autonomy they have been given by the hospital.⁶ Therefore, the impact of the emergency physician is still unknown, and evidence varies, although there are indications that they indeed have a positive impact.⁷⁻⁹ In 2010 the training programme for emergency medicine was provided by 27 out of 105 hospitals with EDs in the country. At that time there were 208 registered emergency physicians. The Ministry of Health had calculated that 400-700 emergency physicians are needed to staff every ED in the Netherlands.¹⁰ The future of emergency medicine as a specialty looks positive. Training programmes are constantly improved and there is a prominent place for the emergency physician in official reports from the Inspectorate of Health, the Ministry of Health and other stakeholders.¹¹⁻¹⁴

Primary care

In 2006 there were 8500 practising GPs in the Netherlands; one GP for every 2347 people.¹⁵ GPs are obliged to organise a 24-h care system of availability, in which both regular and acute care is given during office hours and only acute care after hours. GP after-hours care has changed dramatically over the past 10 years, transforming from solo practices into large GP cooperatives.

There were 131 GP cooperatives and 56 local GP services available in 2006. Together they have approximately 3.5 million patient contacts a year. Almost 70% of GP cooperatives are located in hospital grounds and there is a trend towards working in close relationship with EDs. More than half of all the GP cooperatives have plans to integrate with an ED and a few have already done so.¹⁶

Ambulance services

Ambulances are operated from regional despatch centres and play an important role in the chain of urgent care with respect to the coordination and transportation of acutely ill patients. To ensure good quality patient care, nurses and drivers are specifically trained to provide ambulance care. In the early 1990s, many small private organisations changed into large regional ones with a national training programme and implemented national guidelines in 1992. In 2009 there were 695 ambulances available, making a total of approximately one million despatches per year, of which over 60% were considered to be acute care.¹⁷

How do EDs fit in the overall system of emergency care?

In the Netherlands there is a 45-min time limit for the ambulance service to deliver patients to the hospital when they need urgent medical care. This also includes arriving at the patient within 15 min after being despatched. Both targets are reached in over 98% of all cases.^{15,17} Regional

meetings have been set up to make sure that acute patient care is being guaranteed. EDs take part in these meetings.

The Inspectorate of Health has suggested the implementation of different levels of care provided by EDs to improve the quality of care. These levels should range from basic care to high specialised care.¹ Implementing these levels of care means that larger EDs can provide a higher level of care and will therefore have a greater exposure of high complex patients. Smaller EDs are thus more likely to close down, especially in areas where many EDs are situated in close proximity to each other.⁸ The ED level of care provided also influences the decision of paramedics regarding which ED to go to. The higher the level of care the greater the role of the ED in the chain of acute care.

The development of GP cooperatives also plays a role in the position of the ED. Where they are integrated, the ED will see more complicated patients with a higher urgency, whereas the GP will see the less urgent patients. Patient characteristics in the ED are therefore dependent on whether GP cooperatives will only be open after hours or 24 h round the clock.¹⁸⁻²⁸

Therefore, in general the ED is at the receiving end of emergency care, but in close working relationship with the GP and the ambulance services. The place of the ED within the overall system of emergency care can, however, vary with the level of care provided. The literature often refers to 'the emergency department' but up to now it is still unclear what this consists of. Not all EDs are open 24 h a day, 7 days a week and there is a difference in diagnostic facilities and expertise of the staff.⁹ There are only a few national medical protocols for emergency care and most of the existing ones are local.²⁹ Finally, we see a great variation in the triage systems that are being used. However, an overall triage system (the Netherlands triage system) for emergency care is available for use in EDs, GP cooperatives and ambulance services.^{30,31}

Which patients present to the ED?

Patients presenting to the ED can be categorised into four groups. They are either referred by their GP, present to the ED on their own initiative, are brought in by ambulance or are referred from clinics within the hospital. As mentioned before, there is a difference in emergency medicine between office hours and out-of-hours care. In the beginning of 2000, before large GP cooperatives were founded, the self-referred patients formed between 40% and 80% of all patients presenting to the ED. They were mostly young men from the city with minor trauma, of which 4% had to be admitted. The referred patients were older, both traumatic and non-traumatic and had a higher admission rate, namely 41%.^{18-28,32} The founding of GP cooperatives for after-hours care has reduced the number of self-referrals to the ED by 4-9% and the total number of patients up to 53%, with the largest shift in patients seen with musculoskeletal problems. Recent years have shown an increase in patients looking for emergency care. These

patients tend to be both low complexity patients as well as elderly high complex patients with co-morbidity. The latter is caused by the ageing of the population.

How is the ED staffed?

There is a diversity of professionals working in Dutch EDs. All EDs employ emergency medicine licensed nurses as well as nurses in training; however, their room to practise independently is more limited than in some other countries in the world. For physicians there is a great variety, depending on the size of the ED. Small EDs work with young non-trainees who are being supervised by medical specialists within the hospital. The physicians tend to work at these hospitals to gain experience in emergency care while they wait for a traineeship in various specialties. The bigger EDs are staffed by a combination of non-trainees and trainees for the larger specialties, including surgery, internal medicine, cardiology and paediatric care. In almost two-thirds of EDs, at least one emergency physician is employed.⁵ There are emergency physician trainees in 27 out of 105 hospitals with an ED. Where it has become a common rule that all surgical trainees need to follow an advanced trauma life support course, similar courses for non-surgical trainees are not compulsory. A few hospitals have started to work with physician assistants, but this is a rather new development in the Netherlands.

How do ED specialists interact with primary care and hospital specialists?

There is a shortage of research, so we report here from clinical experience. The way emergency physicians interact with primary care specialists is dependent on their working relationship. Where GP cooperatives are integrated with EDs the communication seems good, with a low threshold for consultation in each direction. This is a result of seeing each other on a regular basis during shifts. Where there are emergency physicians working in EDs, seeing all patients both referred and self-referred, GPs tend to refer more patients to the emergency physician. In hospitals where there are no emergency physicians working or when they only see self-referrals, there is hardly any interaction with GPs. To our knowledge, there is no research available about the interaction between emergency physicians and hospital specialists. What we know from experience is that this differs between hospitals. In most hospitals, emergency physicians are full staff members of the medical board and are seen as colleagues by hospital specialists. This is, however, not the same everywhere.^{33,34}

DISCUSSION

Given the lack of relevant empirical research, we based our results also on reports, theses and organisational websites. Because these are mostly based on a small part of the Dutch ED, it is hard to draw general conclusions with this review. It is, however, clear that the organisation of the whole chain of emergency medicine is evolving quickly in the Netherlands. GP cooperatives and emergency physicians play an important role in this.

Conclusion

EDs in the Netherlands are in different stages of development. However, it is obvious that the presence of emergency physicians is increasing and more EDs will be staffed by emergency physicians. Although this seems an important step, this does not necessarily imply a good position of the emergency physician in the ED. In reality, emergency physicians have to show that they are both medically and logistically capable of running the ED. Given the short existence of emergency medicine, this expertise has to develop in the coming years and is likely to differ between emergency physicians and EDs. Increasing experience and knowledge can be put into improving the quality of care in the ED and within the whole emergency chain together with GPs and ambulance services. What the future patient of the Dutch ED will be, is dependent on the development of different ED levels of care and GP cooperatives. With the different levels of care, we anticipate a decrease in the numbers of EDs, each with a larger exposure to highly complex patients. Should the GP cooperative continue to work the way they do, patient populations in the ED will be different during office hours compared with out-of-hours care, more low complex care compared with high complex care, respectively.

The lack of empirical research also points out the need for research on quality of care in Dutch EDs. This can lead to nationally based emergency medicine guidelines, which will give emergency physicians the autonomy they need. We also need more research on the interaction within the whole chain of emergency care.

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Chapter 3

Emergency departments in the Netherlands: is there a difference in emergency departments with and without emergency physicians? a cross-sectional web-based survey

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ABSTRACT

Background

There is a growing interest in emergency departments (EDs) and the development of emergency medicine in the Netherlands. In the last decade several policy reports have stated that the quality of emergency care should be improved and that emergency physicians (EPs) play a large role in the quality improvement. The Netherlands Society of Emergency Physicians (NVSHA) has developed an emergency medicine training programme, which has been nationally recognised since 2009. Nevertheless, not all EDs are staffed with EPs yet. This study aimed to explore differences between Dutch EDs with EPs and those without EPs.

Methods

A cross-sectional web-based survey was performed on data over the year 2008 or 2009 in all 105 Dutch hospitals with an emergency department. We documented which ED-specific courses were attended by physicians working in the ED (list of 3 courses) and which clinical audit activities were implemented (list of 6 activities). The choice of courses and clinical audits was based on those mentioned in published quality reports and in national debates on emergency care. We compared EDs with and without EPs. The final analysis was based on a linear regression analysis, controlling for ED size and having an EP training programme. We considered $P < 0.05$ significant.

Results

Our survey's response rate was 67%. EPs worked significantly more often in larger EDs. The linear regression analysis shows that the total number of courses attended by physicians was on average 0.51 higher ($P = 0.000$) in EDs with EPs than in EDs without EPs, and the total number of implemented clinical audits was on average 0.49 higher ($P = 0.008$). After controlling for potential confounders, the effect of both the composite number of courses attended ($P = 0.001$) and the composite number of implemented clinical activities ($P = 0.032$) remained significant.

Conclusion

This study shows that EPs are significantly more present in larger EDs and in EDs where there is more continuing professional education and where there are more clinical audit activities. Our findings suggest that the presence of emergency physicians is positively associated with the quality of emergency care, but prospective research is required to examine causality.

BACKGROUND

Organising emergency care is an important topic in many countries. Due to rising healthcare costs and the need to improve the quality of emergency care in the Netherlands, there is a nationwide special interest in Dutch emergency departments (EDs) and the ongoing development of emergency medicine. The Inspectorate of Healthcare published several reports stating that the quality of emergency care should be improved and that EDs could be divided into three different categories, ranging from basic EM care in smaller hospitals, to more specialised care in larger teaching hospitals, to full EM care in university medical centers and trauma centers. This has not been implemented during the timeframe of this study. This also is the case for the national Inspectorate of Healthcare's preference of having an emergency physician (EP) working in every ED.¹⁻³ In response to these reports, expert consensus panelists developed a national quality requirement framework (QFR) intended to improve EM care in Dutch EDs.⁴ A small sample study showed that none of the Dutch EDs complied with these developed indicators. In the first years of the millennium, five Dutch hospitals started an emergency medicine (EM) training programme, which has been officially recognised as a candidate specialty, as of January 2009.^{5,6} The main reason for this development was that up until then Dutch emergency departments (EDs) were mostly staffed with young inexperienced physicians having just graduated as doctors.⁷ Specialists who were not physically present in the ED supervised these physicians. The Dutch emergency medicine training programme is 3 years long and consists of multiple rotations, with intensive care medicine, anesthesiology, cardiology, pediatric medicine, family medicine and ambulance medical services as compulsory. More than 50% percent of the training programme takes place in the ED, and there are three compulsory courses: Advanced Trauma Life Support (ATLS), Advanced Life Support (ALS) and Advanced Pediatric Life Support (APLS). Although the literature states otherwise, some medical specialties in the Netherlands still question the need for an Emergency Medicine specialty.^{4,8-17} Despite the rapidly growing number of EPs in the Dutch EDs, there are still EDs that do not have EPs. This makes the Dutch setting an ideal place for research. We hypothesised that having an EP in the ED will lead to an improvement in the quality of emergency care. The EP is continuously working in the ED, having EM as his domain, and is therefore more committed to implementing quality improvement measures in the ED than physicians who occasionally visit the ED for patient care.¹⁷ The aim of this study was to look at features of all Dutch hospitals and their emergency departments in general and compare EDs with and without EPs. We also documented the continuing professional education of clinical ED staff through attended courses as well as clinical audits through ED registrations and meetings, which we considered proxy measures of the quality of emergency care.

METHODS

Design

We performed a cross-sectional web-based survey using Limesurvey (www.limesurvey.org). Data of the survey was coded and analysed in SPSS 18. The primary outcomes of the study were

continuing professional education and clinical audit activities in emergency departments. The medical ethics committee of Arnhem-Nijmegen granted institutional review board exemption.

Population

We obtained an updated list of all hospitals in the Netherlands from the national website www.ziekenhuis.nl in December 2009. Of the 170 listed locations, 105 hospitals met the inclusion criteria of having an operating emergency department in the years 2008 and 2009. Between January and March 2010, these 105 emergency departments were contacted by telephone. The purpose was to identify a contact person in each ED, typically the head of staff and preferably the consultant, or the head manager of the ED, to explain the goal of this study. Of the 105 hospitals with an operating ED, 101 agreed to participate. Four EDs refused because the data requested was not available or because of lack of time or interest. A few hospitals had more than one ED location. Where hospitals had an operating ED in more than one location, only one questionnaire was filled out. This was because policies on courses and registrations were the same in multiple ED locations of the same hospital. However, differences between these EDs in general features and registrations that could not be filled out in one questionnaire were separately documented by personal telephone interviews and put in the SPSS database manually. This was also the case if, in the timeframe of the data collection, there had been a change in course policy or registration. A total of 97 questionnaires were eventually sent, representing all of the 101 participating EDs.

Measures

First, we measured general characteristics of both the hospital and the ED, including the number of hospital beds, acute care facilities, general facilities, number of ED visits per year, percentage of self-referrals and whether EDs used a triage system. Secondly, we checked if an ED had an EP. Having an EP in the ED was defined as having an ED with at least one EP in the group of EDs with EPs. Since EM is a young specialty in the Netherlands, there are not enough EPs to facilitate 24/7 emergency care in all EDs in the Netherlands. We defined emergency physicians as physicians who successfully finished the Dutch EM training programme and were registered as EPs in the Dutch Medical Specialist Registration Committee (MSRC) or EPs working in the studied EDs that were registered as EPs in their own country with a recognised EM training programme. Thirdly, we documented which ED-specific courses physicians needed to have attended, past or present, when working in their current ED (list of 3 courses) and which clinical audit activities were implemented (list of 6 activities). The choice of courses and clinical audits was based on those mentioned in published Dutch emergency department's quality reports and in national debates on emergency care. The questionnaire was designed by experienced researchers, authors 3 and 4, after reviewing the literature and a pilot testing by a randomly chosen ED. This ED later also participated in the final survey. Each contact person was asked to answer the questions with the most recent data available, preferably containing 2009, but if that was not possible then 2008. It

was suggested that filling out the survey could be a joint effort of medical personnel and management working in the ED. This was to minimise the influence of recall bias and missing data. Over a 3-month period, a maximum of three reminder emails were sent if the survey had not been completed. On follow-up, reasons for not filling out the survey were: the available data was incomplete, there was a lack of time or the head of staff had changed during the timeframe of the survey.

Analysis

For the comparison of characteristics of EDs with EPs and EDs without EPs, we used either t-tests or chi-square tests as appropriate. For exploration of a possible effect of the presence of EPs on continuing professional education and clinical audit activities, we used linear regression analysis. This allowed controlling for potential confounders. Dependent variables in this analysis were the number of emergency care courses physicians attended and the number of clinical audit activities implemented. The independent variable was the presence of an EP. We controlled for the size of the ED and the presence of an EP training programme. In model I we checked the effect of the presence of EPs on each of these two outcomes, and in model II we added the two potential confounders. Size of the ED was added to control for possible financial and organisational advantages of larger EDs. The existence of an EP training programme was added because two of the courses (ALS and ATLS) documented are compulsory in the EM training programme. In all analyses we considered $p < 0.05$ as statistically significant. Standard errors in the regression analysis were adjusted for the finite population correction (69 out of 105 EDs in the Netherlands).

RESULTS

Out of the 97 questionnaires sent, representing 101 EDs, we received 65 questionnaires, a response rate of 67%. These 65 questionnaires represented 69 EDs (67% of all Dutch EDs) (Table 1). The responding hospitals included academic hospitals, trauma centers, large community hospitals and smaller rural hospitals with a mean of 456 (200–1100) beds for hospitals with EPs and 349 (144–600) beds for hospitals without. Every region in the country was represented. Almost all hospitals (over 95%) had an intensive care, a coronary care and a stroke unit. Half of the responding hospitals, the majority in the EP group, reported to have an emergency cardiac care unit where patients with a cardiac diagnosis, or a high suspicion of one, were seen directly by cardiologists, thereby mostly bypassing the emergency department. Overall, we found no significant differences in general hospital features between EDs with EPs and EDs without EPs.

Emergency department features show that EDs with EPs had significantly more patients attending the ED per year, with a mean of 24.613 (7.818–48.230) compared to 19.408 (8.100–42.000, $P = 0.048$). We found a mean self-referral rate of 34% (0%–80%) in EDs with EPs compared to 29% (5%–65%) in EDs without EPs. Apart from one missing variable, all emergency

departments except one were open 24 hours. There was a significant difference for having a shock room in the ED, namely 38 (100%) in EDs with EPs and 20 (74%) in EDs without EPs ($P = 0.004$).

Table 1. General descriptions of hospitals and EDs^a

		EP (N=38)	No EP (N=27)	P value
Hospital features	Number of hospital beds ^c	456 (200-1.100)	349 (144-600)	0.059
	Distance to nearest other hospital (Km) ^c	18,3 (2-40)	22 (1-80)	0.332
	Location ^b	City	10	0.494
		Urban	12	
		Rural	4	
	Type ^b	Academic ^b	0	0.124
		Trauma center	1	
		General	25	
	Facilities ^b	Intensive care	25	0.329
		Coronary care	24	0.133
		Stroke unit	25	0.329
		Emergency cardiac care	12	0.690
		Acute admission ward ^c	0	0.371
ED features	Patients per year ^d	24.613 (7.818-48.230)	19.408 (8.100-42.000)	0.048*
	ED Admissions per year ^c	6.221 (2.100-10.800)	5.418 (2.000-9.975)	0.287
	Self referrals (%) ^c	34 (0-80)	29 (5-65)	0.427
	Facilities ^b	Open 24/7	25	0.847
		Triage system	23	1.000
		Shockroom	20	0.004*
		Observation unit	9	0.410

^a The table describes 65 questionnaires, representing 70 hospitals. ^b All academic hospitals are also trauma centers,

^c Chi square for independence, ^d independent samples T-test, * statistically significant at $P < 0.05$.

Table 2. Training of physicians and quality improving activities in EDs with EPs compared to EDs without EPs

		Number of Emergency Departments		P value
		With EP N=38 (%)	Without EP N=27 (%)	
Continuing professional education for physicians	EP specialty training ^a	19 (50,0)	0 (0,0)	0.001*
	Advanced Trauma Life Support	37 (97,4)	20 (74,1)	0.005*
	Advanced Cardiac Life Support	38 (100)	25 (92,6)	0.088
	Electro Cardio Graphic course	19 (50,0)	6 (22,2)	0.023*
Clinical audit activities	Complications registration ^b	11 (28,9)	5 (18,5)	0.336
	Complaint registration ^c	28 (73,7)	19 (70,4)	0.769
	Adverse event reporting ^d	37 (97,4)	25 (92,6)	0.366
	Electronic patient record	29 (76,3)	15 (55,6)	0.078
	Radiology meeting ^e	37 (97,4)	21 (77,8)	0.012*
	Child abuse meeting	37 (97,4)	25 (92,6)	0.366

^a Not all EDs where EPs work also have an EP specialty training programme, ^b complications that happened around patient treatments, registered by medical staff, ^c complaints made by patients to the hospital, ^d serious complications that have to be reported to the inspectorate of health, ^e A meeting with the EP and a radiologist looking at all radiology diagnostic tests of patients visited the ED the day before, * Significant.

Table 2 shows that physicians had attended significantly more courses in EDs with EPs. Differences, apart from the obvious EP specialty training (50.0% vs. 0.0%, $P = 0.000$), were found for the ATLS course (97.4% vs. 74.1%, $P = 0.004$) and the ECG course (21.1% vs. 11.1%, $P = 0.023$). Radiology meetings, where diagnostic research is reviewed the following day by a radiologist to reduce the number of missed diagnoses, were significantly more implemented in EDs with EPs (97.4% vs. 77.8%, $P = 0.012$). There were no differences for the other clinical audit activities.

The linear regression analysis is shown in Table 3. Model I shows that the total number of courses attended by physicians was on average 0.51 higher ($P = 0.000$) in EDs with EPs than in EDs without EPs, and the total number of implemented clinical audits was on average 0.49 higher ($P = 0.008$). After controlling for potential confounders (model II), the effect of both the composite number of courses attended ($P = 0.001$) and the composite number of implemented clinical activities ($P = 0.032$) remained significant.

Table 3. Results of the regression analysis

		model I			model II		
		B	SE	P	B	SE	P
Continuing professional education for physicians (Mean number of courses attended by physicians)	constant	1,96	0,07		1,75	0,13	
	EP (no EP ref.)	0,51	0,10	0.000*	0,37	0,11	0.001*
	Nr. attending ED patients (x 10.000)				0,11	0,06	0.057
	EP training programme				0,16	0,14	0.268
Clinical audit activities (Mean number of activities)	constant	5,12	0,14		4,52	0,24	
	EP (no EP ref.)	0,49	0,18	0.008*	0,46	0,21	0.032*
	Nr. attending ED patients (x 10.000)				0,31	0,11	0.005
	EP training programme				-0,28	0,27	0.304
N	64						

* Significant

DISCUSSION

Our survey's response rate was 67%. EPs worked significantly more often in larger EDs. We found that in EDs with EPs, physicians attended significantly more courses and implemented more clinical activities than EDs without EPs. These differences remained significant in the regression analyses for both the number of courses and implemented clinical activities.

The lowest number of patient visits per year in our study, representing 69 EDs, was 7,818. The study of Ikkersheim, conducted in the same period and representing 27 Dutch EDs, found a minimum of 3,466 patient visits per year.⁴ This could be due to the different percentage of rural hospitals in the overall study, being 21.5% in our study compared to 63% in Ikkersheim's. They also found a 100% score in having a triage system compared to our 85% in EDs without EPs (100% in EDs with EPs). This could simply be explained by the overall number of EDs studied.

Our data also shows that EPs work in small and large hospitals as well as in academic settings in all regions of the Netherlands. EPs however work significantly more often in EDs with larger patient visits per year. This is probably because EPs initially started working in larger EDs with EM training programmes and over time expanded to academic hospitals and rural areas. In emergency departments with EPs, physicians had attended more courses both individually and as composite numbers compared to emergency departments without EPs. After controlling for a training programme, the number of courses attended remained significant.

We also found that in emergency departments with EPs, more clinical audit activities were undertaken. This association remained significant after controlling for the size of the department. It is likely that the significant difference in the radiology meeting could be the underlying cause for the significant composite numbers of clinical audits in EDs with EPs. A large liability insurance company for hospitals instigated the radiology meeting together with EPs from the Netherlands Society of Emergency Medicine (NVSHA).¹⁸ The significant difference in the number of hospitals with EPs that have a radiology meeting, suggests the influence of EPs on implementing clinical audit activities. Although the financial capacity for larger EDs might be influential in attending more courses or implementing clinical audits, our data does not support this hypothesis. Very little has been reported on training courses and quality-improving activities in Dutch emergency departments. Van Geloven found a very low percentage of physicians in the ED having followed courses like ATLS (27%) or ECGs (6%). That study however, was carried out in 1999 before the introduction of the emergency medicine training programme.⁷ This could explain the higher numbers we found. Our study suggests that EPs have a positive influence on physicians attending ABCDE courses and in implementing clinical audit activities, but it is likely that ED leadership or hospital management is influential as well. Although this was one of the first nationwide inventories of its kind in the Netherlands, and other factors were mentioned as well, the positive influence of EPs suggests that their presence could improve the quality of care and therefore patient safety.

At the moment there are not enough EPs to staff all the EDs in the Netherlands and the length of their training programme, 3 years, is not meeting the criteria of the 'Doctors' Directive of the European Union, which states it should be 5 years (EU Directive 2006/100/EC).¹⁹ Dutch EPs need the longer training programme and simultaneously the recognition as a medical specialist to run the ED as a closed format. Undoubtedly, EPs have improved the quality of patient care on an individual patient level, but until the above-mentioned criteria are met, it will be difficult for EPs to implement overall clinical audits for all ED patients.

This study might also suggest that increasing the size of EDs in the Netherlands could potentially improve quality registrations and meetings. Although audit and feedback were found to have a moderately positive effect in the most recent Cochrane review, this study cannot identify causal

effects.²⁰ Consequently, this would then lead to a reduction in the number of EDs. We already see a similar occurrence in GP practices where larger practices seem to have more safety features present.^{21,22}

Limitations

Some limitations of this study should be mentioned. We cannot rule out a possible selection bias, as the response rate was 67%. However, our sample included a variety of EDs from every region in the country, suggesting reasonable representativeness. Respondents had different backgrounds and positions, which may have influenced their answers and could have resulted in information and recall bias. This response rate is however high compared to many surveys among healthcare providers. Furthermore, the relation between non-response and selection bias is not so obvious.

This study documented the presence of EPs in the ED, not taking into account the total numbers of EPs and whether or not they were present 24/7. Therefore we cannot say that it is the influence of the EPs alone that leads to a higher percentage of courses attended.⁵ It could well be that it is in fact the hospital that wants to improve the quality of care and therefore employs EPs and lets other physicians, working in the ED, attend necessary courses. However, finding a significant difference in having a radiology meeting in EDs with EPs, an initiative strongly supported by emergency physicians may suggest a positive influence of EPs.

Our study focused on general features, continuing professional education and clinical audit activities, which do not necessarily reflect the quality of patient care. However, after the timeframe of the data collection of this study, the Dutch inspectorate of health issued a document stating that all physicians working in the ED are obligated to attend an ABCDE course before treating ED patients. This might suggest that training and quality activities may benefit the quality of patient care. Given the cross-sectional design, however, this study cannot identify causal effects.

Conclusion

Our study was designed to examine whether, in the short time that EPs have been present in Dutch EDs, there has been a difference in EDs with and without EPs. It showed that EPs are significantly more present in larger EDs and in EDs where there is more continuing professional education and where there are more clinical audit activities. We assume that these courses and registrations have a positive influence on the quality of care provided in Dutch EDs. Although this study could not identify causal effects, our findings might suggest that the presence of emergency physicians is positively associated with quality of care.

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Chapter 4

GP cooperative and emergency department: an exploration of patient flows

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ABSTRACT

Rationale, aims and objectives

In most countries, different health care providers are involved in emergency care. In the Netherlands, out-of-hours care is provided by general practitioner cooperatives (GPCs) and emergency departments (EDs). Our aim was to describe the flow of patients attending emergency care in these settings.

Methods

A retrospective record review was performed, concerning patients who had visited a GPC or ED. Recorded information included urgency, diagnostic tests, and follow-up contacts. Descriptive figures were determined for patient flows in GPC and ED for urgent contacts and non-urgent contacts.

Results

We included 319 GPC contacts and 356 ED contacts, of which 78% were non-urgent.

The majority of GPC contacts were completed at the GPC without follow-up; 37% of non-urgent patients had a follow-up contact, usually with primary care. Only 5% of non-urgent GPC patients received diagnostic tests compared to 63% of non-urgent ED patients (mostly X-rays). The majority of non-urgent ED patients (88%) had a follow-up contact, usually at an outpatient clinic (67%). Most non-urgent ED patients (83%) who received a diagnostic test also had an outpatient clinic follow-up contact. Of urgent ED patients, the majority had a follow-up contact (85%), mostly with an outpatient clinic (74%).

Conclusion

Although most out-of-hours care patients present with non-urgent health problems, at the ED they are more likely to receive diagnostic tests and follow-up contacts. This may reflect differences in patient populations between the ED and GPC or suggest opportunities for improving efficiency of planning follow-up contacts.

INTRODUCTION

Most European countries have several emergency care providers, including primary care services, hospital emergency departments (EDs), and ambulance dispatch centres.¹ General practitioners (GPs) increasingly provide out-of-hours primary care in large-scale GP cooperatives (GPCs). In the Netherlands, patients access GPCs mostly by telephone, and after nurse telephone triage, a face-to-face GP contact is planned if needed.¹ Patients access the ED physically, either referred or on their own initiative. GPCs are only open out-of-hours, whereas EDs are open 24 hours a day, 7 days a week. Recently, there is a trend towards physical co-location of primary care and EDs to provide out-of-hours care.²⁻⁵

Workload has increased at GPCs and EDs due to increasing numbers of patients presenting with non-urgent health problems.^{4,6,7} The fact that patients have easy access to emergency care settings might explain this trend.^{1,8} Other reasons for self-referral are patients' expected need for diagnostic tests and directly provided help.^{1,9,10} Previous studies have shown that one-third to half of patients had a follow-up contact following a GPC contact or a nurse telephone consultation.^{11,12} Reasons for a follow-up contact included perceived worsening of symptoms and patients' worries about the medical condition.¹² Alternatively, health care professionals may induce follow-up contacts by ordering diagnostic tests or prescribing drugs that require monitoring. Little is known about the number of follow-up contacts at the outpatient clinics after an ED visit, but estimations vary between 26% and 49%.^{1,3} Clinical experience suggests that a large group of ED patients has a follow-up contact at an outpatient clinic in the hospital.

While follow-up contacts may be needed for specific conditions, like bone fractures and major wounds, the need appears less obvious for many other conditions. They may reduce overall efficiency of health care. The increased workload at GPCs and EDs reinforces the need to optimise the flow of patients in emergency care as well as its follow-up in hospital or primary care.^{4,6,7} The aim of this study was to explore the flow of patients attending emergency care services in the Netherlands, with a focus on self-referring patients and the role of estimated level of urgency.

MATERIALS AND METHODS

Design and setting

We performed a retrospective observational study, using registration systems of one GPC and one ED in the Netherlands. We matched the GPC and ED contacts with electronic patient records at general practices.

This study was conducted in one region with a co-located GPC and ED that shared one entrance for all patients. Patients typically approached the GPC by telephone and the ED physically, either referred or on their own initiative. Self-referring patients were triaged by a nurse at the entrance,

and consequently referred to the GPC (out-of-hours) or the ED. Both settings used the Netherlands Triage Standard (NTS),^{13,14} and in addition, the GPC used national telephone guidelines.¹⁵

Because Dutch general practices keep complete documentation of the health care their patients receive, including contacts with emergency care settings and subsequent health care use, data was collected in a convenience sample of 10 GPs associated with the GPC. For each GP, we retrospectively selected the first 35 consecutive patient contacts with both settings from May 2009. For patients who had multiple contacts with the GPC or ED, only the most recent contact was included in the sample as the index contact. We excluded administrative reports without a patient contact, contacts without urgency estimation, and GPC contacts for a confidential reason.

Procedure and measures

First, we identified patients from the registration systems of the GPC and the ED. Next, an independent reviewer – an experienced GP – assessed the medical records of all sampled patients in the general practices. The electronic patient records included information about the contact with the GPC or ED, test results and specialists' letters. This reviewer used a review form that had been developed for this study to register all required data.

Of the index contact, we collected the following information: referral to ED (referred or self-referring), diagnostic tests and follow-up advice. Also, the reviewer registered whether a patient had a follow-up contact (with their own GP, outpatient clinic, GPC, ED or ambulance care) relating to the index contact, and if the patient had contacted his own GP about the same health problem within 1 week prior to the index contact.

Data analysis

We made an overview of the flow of patients in emergency care settings related to the urgency level. First, we divided the patient contacts into two groups according to the urgency estimation of triage nurses: non-urgent contacts (level 3, 4 or 5), and urgent contacts (level 1 and 2; Box 1). In two flowcharts, we presented the flow of patients for these groups. Next, we made a flowchart for referred and self-referring patients at the ED.

Box 1. Urgency criteria from national telephone guidelines and the Netherlands Triage Standard

National telephone guidelines				Netherlands Triage Standard		
	Level	Definition	Action	Level	Definition	Action
Urgent	1	Vital functions are in danger	Immediate	1	Vital functions are threatened or delaying treatment will cause serious and irreparable damage to the patient's health	Immediate
	2	Real danger of patients condition quickly deteriorating with risk of vital functions falling out	As soon as possible, within an hour at most	2	Vital functions are not (yet) in danger, but there is a fair chance that the patient's condition will soon deteriorate or delaying treatment will cause serious and irreparable damage to the patient's health	Take action as soon as possible.
Non-urgent	3	Evaluation within hours for medical or emotional reasons	Within a couple of hours	3	Treat within a few hours because of medical or humane reasons	Do not postpone too long.
	4	No time pressure; triage nurses arrange an appointment or give self-care advice	No time pressure	4	There is no time pressure from medical or other grounds.	Time and place should be discussed with the patient
				5	Advice	A physical examination can wait until the next day

RESULTS

Characteristics

A total of 675 patient contacts were included: 319 GPC contacts and 356 ED contacts (Table 1). Compared with GPC patients, ED patients were more often male (55% versus 48%) and the mean age was higher (42.2 years versus 36.8 years). In total, 78% of contacts were triaged as non-urgent (level 3 to 5). More ED patients were triaged as urgent (level 1 and 2) than GPC patients (respectively 34.8% and 6.9%). Furthermore, 53.7% of ED contacts occurred out-of-hours.

Table 1. Characteristics of contacts (N=675)

Characteristics	GP cooperative			Emergency department		
	Total (N=319)	Urgent (N=22)	Non-urgent (N=297)	Total (N=356)	Urgent (N=124)	Non-urgent (N=232)
Gender (% male)	48.3	40.9	48.8	55.3	51.6	57.3
Age (mean)	36.8	40.6	36.5	42.2	53.1	36.4
Estimated urgency (% highly urgent=U1+2)	6.9			34.8		
Self referral (%)	-			37.4		
Out-of-hours (%)	100			53.7		

Flow of patients

Non-urgent contacts

At the GPC, 93% of the contacts were assessed as non-urgent (Figure 1). In 94% of these non-urgent patients, no diagnostic tests were ordered, and only two patients were admitted to the hospital after the initial contact. Of non-urgent patients who had not received diagnostic tests, 9% had a contact with their own GP prior to the GPC contact. Also, 35% had a follow-up contact, either with their own GP (24%) or the GPC/ED (11%). For non-urgent patients who had received diagnostic tests, the follow-up rate was higher: 38% with their own GP and 13% with the GPC.

At the ED, 65% of the contacts were assessed as non-urgent. In 35% of these patients, no diagnostic tests were ordered; in 50%, diagnostic tests were ordered (90% received an X-ray); and 15% were admitted to the hospital. An outpatient clinic follow-up contact occurred in 37% of patients for whom no diagnostic tests were ordered. Of non-urgent patients with diagnostic tests, a considerable number (83%) had a follow-up contact with an outpatient clinic. Furthermore, 43% of non-urgent patients for whom no diagnostic tests had been ordered, had a follow-up contact with the GPC (91%) or ED/ambulance (9%).

Urgent contacts

At the GPC, 7% of patients were triaged as urgent (Figure 2). In 64% of these contacts, no diagnostic tests were ordered; in 14%, diagnostic tests were ordered; and 23% were admitted to the hospital. In total, 64% of urgent GPC contacts had a follow-up contact. Approximately one-third (35%) of the ED contacts were triaged as urgent. In 35% of these patients, diagnostic tests were ordered, and 60% were admitted to the hospital. The majority of these patients had a follow-up contact with an outpatient clinic (respectively 70% of patients with diagnostic tests and 76% of hospitalised patients). Furthermore, six patients were discharged from the ED without receiving diagnostic tests, but five were given an outpatient clinic appointment.

Self-referring patients at the ED

Of the 232 non-urgent patient contacts at the ED, 48% were self-referred. The majority of these self-referring patients did not receive diagnostic tests (55%), and for the remaining group in most cases, an X-ray was ordered (98% of patients who received diagnostic tests). Of self-referring patients who did not receive diagnostic tests, 52% had a follow-up contact at the GPC and 19% at an outpatient clinic. Patients who received diagnostic tests frequently had an outpatient clinic contact (83%). Referred patients often received diagnostic tests (57%) and had a follow-up contact at an outpatient clinic frequently (approximately 84%; Figure 3).

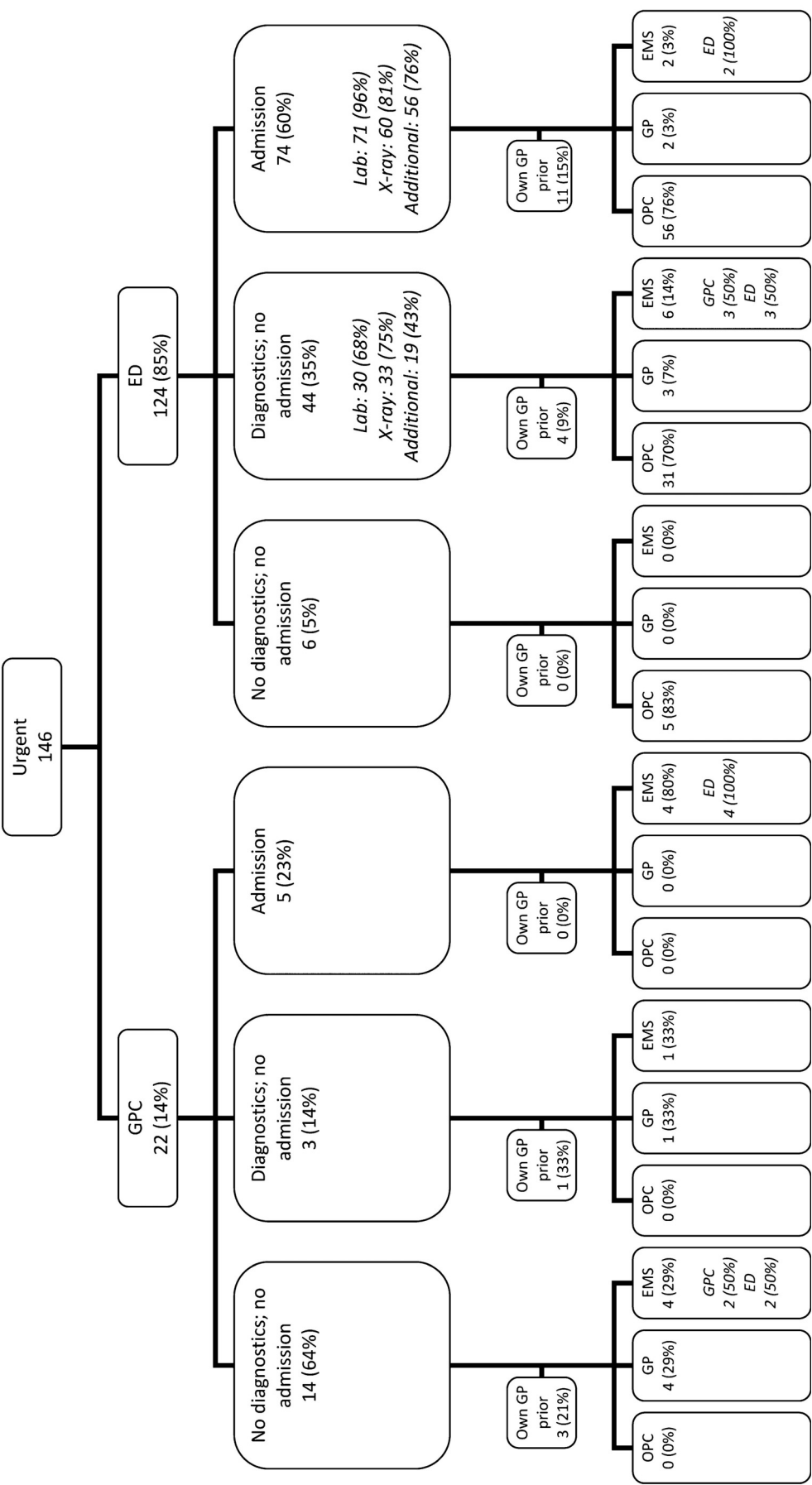
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graph TD
    A[Non-urgent 529] --> B[GPC 297 56%]
    A --> C[ED 232 44%]
    B --> D[No diagnostics; no admission 279 94%]
    B --> E[Diagnosics; no admission 16 5%]
    B --> F[Admission 2 1%]
    C --> G[No diagnostics; no admission 82 35%]
    C --> H[Diagnosics; no admission 115 50%]
    C --> I[Admission 35 15%]
    D --> J[Own GP prior 25 9%]
    E --> K[Own GP prior 4 25%]
    F --> L[Own GP prior 1 50%]
    G --> M[Own GP prior 4 5%]
    H --> N[Own GP prior 7 6%]
    I --> O[Own GP prior 1 3%]
    J --> P[OPC 2 1%]
    J --> Q[GP 67 24%]
    J --> R[EMS 30 11%]
    P --> S[ED 15 50%]
    P --> T[GPC 15 50%]
    Q --> U[ED 15 50%]
    Q --> V[GPC 15 50%]
    R --> W[ED 15 50%]
    R --> X[GPC 15 50%]
    K --> Y[OPC 1 6%]
    K --> Z[GP 6 38%]
    K --> AA[EMS 2 13%]
    Y --> AB[ED 2 100%]
    Y --> AC[GPC 2 100%]
    Z --> AD[ED 2 100%]
    Z --> AE[GPC 2 100%]
    AA --> AF[ED 1 100%]
    AA --> AG[GPC 2 100%]
    L --> AH[OPC 0 0%]
    L --> AI[GP 0 0%]
    L --> AJ[EMS 1 50%]
    AH --> AK[ED 1 100%]
    AH --> AL[GPC 0]
    AI --> AM[ED 0]
    AI --> AN[GPC 0]
    AJ --> AO[ED 1 100%]
    AJ --> AP[GPC 0]
    M --> AQ[OPC 30 37%]
    M --> AR[GP 2 2%]
    M --> AS[EMS 35 43%]
    AQ --> AT[ED 1 3%]
    AQ --> AU[GP 2 29%]
    AQ --> AV[GPC 32 91%]
    AR --> AW[ED 5 71%]
    AR --> AX[GP 4 4%]
    AR --> AY[EMS 7 6%]
    AS --> AZ[ED 5 71%]
    AS --> BA[GP 4 4%]
    AS --> BB[EMS 7 6%]
    N --> BC[OPC 96 83%]
    N --> BD[GP 4 4%]
    N --> BE[EMS 7 6%]
    BC --> BF[ED 5 71%]
    BC --> BG[GP 2 29%]
    BC --> BH[GPC 32 91%]
    BD --> BI[ED 5 71%]
    BD --> BJ[GP 4 4%]
    BD --> BK[EMS 7 6%]
    BE --> BL[ED 5 71%]
    BE --> BM[GP 4 4%]
    BE --> BN[EMS 7 6%]
    O --> BO[OPC 29 83%]
    O --> BP[GP 0 0%]
    O --> BQ[EMS 1 3%]
    BO --> BR[ED 1 100%]
    BO --> BS[GP 0]
    BQ --> BT[ED 1 100%]
    BQ --> BU[GPC 0]
  
```

The flowchart illustrates the distribution of 529 non-urgent cases. It starts with a total of 529 cases, which are split into GPC (297, 56%) and ED (232, 44%). Each category is further divided into three sub-categories: 'No diagnostics; no admission', 'Diagnosics; no admission', and 'Admission'. Each sub-category then branches into 'Own GP prior' and 'Referral' (OPC, GP, EMS). The 'Referral' category is further divided into 'ED' and 'GPC' outcomes. The 'Own GP prior' category is further divided into 'ED' and 'GPC' outcomes. The 'Referral' category is further divided into 'ED' and 'GPC' outcomes. The 'Own GP prior' category is further divided into 'ED' and 'GPC' outcomes.

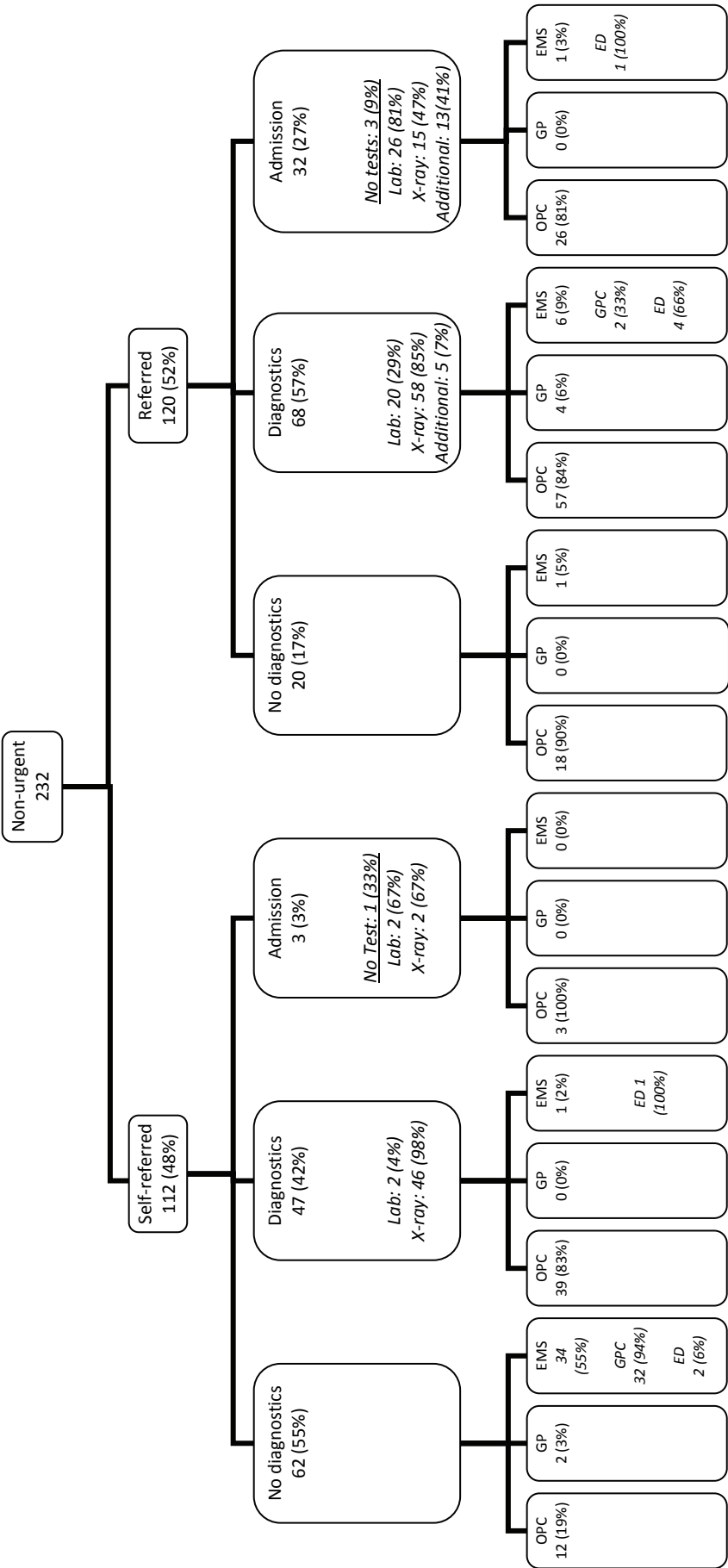
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Figure2. Urgent contacts at the GP cooperative and ED: flow of patients in the health care system



GPC = General practitioner cooperative; ED = Emergency department; Lab = Laboratory tests; Additional = Additional diagnostic tests; OPC = Out-patient clinic in the hospital; GP = Own general practitioner; EMS = Emergency medical service (GP cooperative, Emergency department or ambulance service).

Figure 3. Non-urgent ED contacts: flows for referred and self-referred patients



GPC = General practitioner cooperative; ED = Emergency department; Lab = Laboratory tests; Additional = Additional diagnostic tests; OPC = Out-patient clinic in the hospital; GP = Own general practitioner; EMS = Emergency medical service (GP cooperative, Emergency department or ambulance service).

DISCUSSION

Main findings

We explored the flow of patients attending emergency care in a GPC and ED. At the GPC, almost two-thirds of contacts were completed there, mostly without using diagnostic tests; the other third had a follow-up contact, usually with primary care. At the ED, diagnostic tests were frequently ordered, particularly X-rays.

In about two-thirds of contacts, ED patients had a subsequent follow-up at the outpatient clinic. At the GPC, most contacts were completed directly, as only 37% of non-urgent patients had a follow-up contact. Previous studies found that one-third to half of patients had a follow-up contact after a GPC or a nurse telephone contact.^{11,12,16,17} Several reasons for a follow-up contact have been identified, such as worsening of complaints, need for reassurance or dissatisfaction.^{12,18,19} Furthermore, patients could have been advised to contact their own GP during office hours, in particular when they had a telephone consultation. One study found that a large majority of follow-up actions after a telephone contact seemed appropriate.¹⁷

On the other hand, many ED contacts (69%) had a follow-up contact with an outpatient clinic, while other research has reported figures varying from 26% to 49%.^{1,3,16} Also, nonurgent self-referring patients who received an X-ray frequently had a follow-up contact. One reason may be that the type of health problems and patients seen at the ED require this follow-up.^{1,20} There might also be other reasons for an outpatient clinic contact. Medical specialists may tend to keep patients referred by GPs under their own care, for example, after requests for diagnostic tests or treatment. Moreover, inexperienced doctors may work in the ED, without direct supervision, especially in smaller hospitals. Consequently, specialists might plan a follow-up contact as an additional check. Finally, it could be partly related to the Dutch payment system for specialist care.

However, we were unable to define the reasons for outpatient clinic contacts and estimate the number of potentially avoidable follow-up contacts. Overall, our results suggest that the majority of patients stayed within one setting for follow-up, either primary care or ED/hospital care, even in a co-located emergency setting. The effect of the newly established co-location might not be completely evident yet, as implementation and collaboration continued to progress. Other studies found that co-location could improve efficiency of emergency care, especially for self-referring nonurgent patients,^{3,10} but our results were inconclusive. In general, it seems reasonable that GPC contacts stayed within primary care, but for ED contacts, there might be opportunities to redirect ED contacts (e.g. referral to primary care, at least for follow-up, use of nurse practitioners).

At the ED, patients received diagnostic tests frequently. This might be the result of a higher a priori probability of an urgent medical problem,^{21,22} a high frequency of trauma-related contacts,^{1,20} disease-specific protocols or ordering diagnostic tests in advance (prior to consultation). Redirecting self-referring patients to the GPC, with access to diagnostic facilities for GPs (particularly X-ray), might enhance efficiency.^{1,3,9,23} Introducing a GP to the ED resulted in ordering fewer additional diagnostic tests for self-referring patients during office hours.²¹⁻²⁴ Efficiency could also be supported by implementation of treatment protocols for non-urgent contacts that include the preferred follow-up care, financial arrangements for EDs and GPs in case of co-location and continuing implementation of the emergency doctor training programme in the Netherlands.

Strengths and limitations

This observational study combined data from registration systems of a GPC and ED with electronic patient records at the general practice. Therefore, we were able to give a complete view of flows in emergency care. Regarding patients, our data seemed quite representative, as ED non-urgent contacts more frequently are male and of young age.^{1,10} However, the percentage of urgent ED contacts was high, probably as a consequence of including referred patients in our sample. The study setting represented the current trend towards co-location of GPCs and EDs. Co-location also meant that both settings shared many characteristics, so that these could not confound the comparison. Although the setting was not representative for the national situation, we expect that our findings will be more pronounced in settings without co-location. The period of data collection was longer for ED contacts. A pilot with a new triage system (NTS) started before our data collection. This might have affected the estimation of urgency, as ED nurses were used to the Manchester Triage System. Also, the ED contacts included referred and self-referring patients, which may have influenced the figures.

Implications for practice and future research

The high number of follow-up contacts at outpatient clinics, in particular for non-urgent ED contacts, need to be studied in more detail. The figure may reflect the patient population at EDs, but it may also suggest opportunities for improving the efficiency of planning follow-up contacts. A better insight into the reasons for an outpatient clinic contact could help decision makers to adjust flows and improve efficiency in emergency care. It may be possible that GPC patients with non-urgent contacts received too few follow-up contacts, but this hypothesis is not supported by clinical experience.

Furthermore, many non-urgent ED patients frequently had received an X-ray. Access to X-ray facilities by GPs in emergency care may be explored, particularly in co-located settings. This might redirect the flow of patients and enhance the efficiency of emergency care.²¹⁻²⁴ Moreover, extending opening hours of the GPC or positioning a GP or emergency doctor at the ED might

contribute to the efficient treatment of self-referring patients.^{23,24} Finally, further evaluation of the effects of a well-implemented and functioning co-location of GPC and ED is needed. Our study gave an explorative overview of flows in a relatively new co-location.

Conclusion

Exploration of the flow of patients attending emergency care showed that at the GPC, almost two-thirds of contacts was completed there, mostly without using diagnostic tests; the other third had a follow-up contact, usually in primary care. Although most ED patients had non-urgent health problems, diagnostic tests were frequently ordered, and about two-thirds of patients had a follow-up at an outpatient clinic. While a follow-up contact may be legitimate, the high number of follow-up contacts may compromise the efficiency of health care delivery.

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Chapter 5

The impact on emergency department utilisation and patient flows after integrating with a general practitioner cooperative: an observational study

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Paul Giesen
Michel Wensing

ABSTRACT

Introduction

A new model, an emergency care access point (ECAP) for after-hours emergency care, is emerging in the Netherlands. This study assessed the effect on emergency department (ED) utilisation and patient flows.

Methods

Routinely recorded clinical ED patient data, covering a six-year period, was collected. Segmented regression analysis was used to analyse after-hours changes over time.

Results.

59.182 patients attended the ED before the start of the ECAP and 51.513 patients after, a decrease of 13%. Self-referred ED patients decreased 99.5% (OR 0.003; 95% CI 0.002–0.004). Referred patients increased by 213.4% and ED hospital admissions increased by 20.2%. A planned outpatient follow-up increased by 5.8% (OR 1.968 95% CI 1.870–2.071). The latter changed from fewer contacts to more contacts (OR 1.015 95% CI 1.013–1.017). Consultations at the regional general practitioner cooperative (GPC) increased by 26.0% (183.782 versus 232.246).

Conclusion

ECAP implementation resulted in a decrease in ED utilisation, a near absence of self-referring patients, and a higher probability of hospital admission and clinical follow-up. This suggests either an increase of ED patients with a higher acuity or a lower threshold of admitting referred patients compared to self-referred patients. Overall, increased collaboration with after-hours primary care and emergency care seemed to optimise ED utilisation.

INTRODUCTION

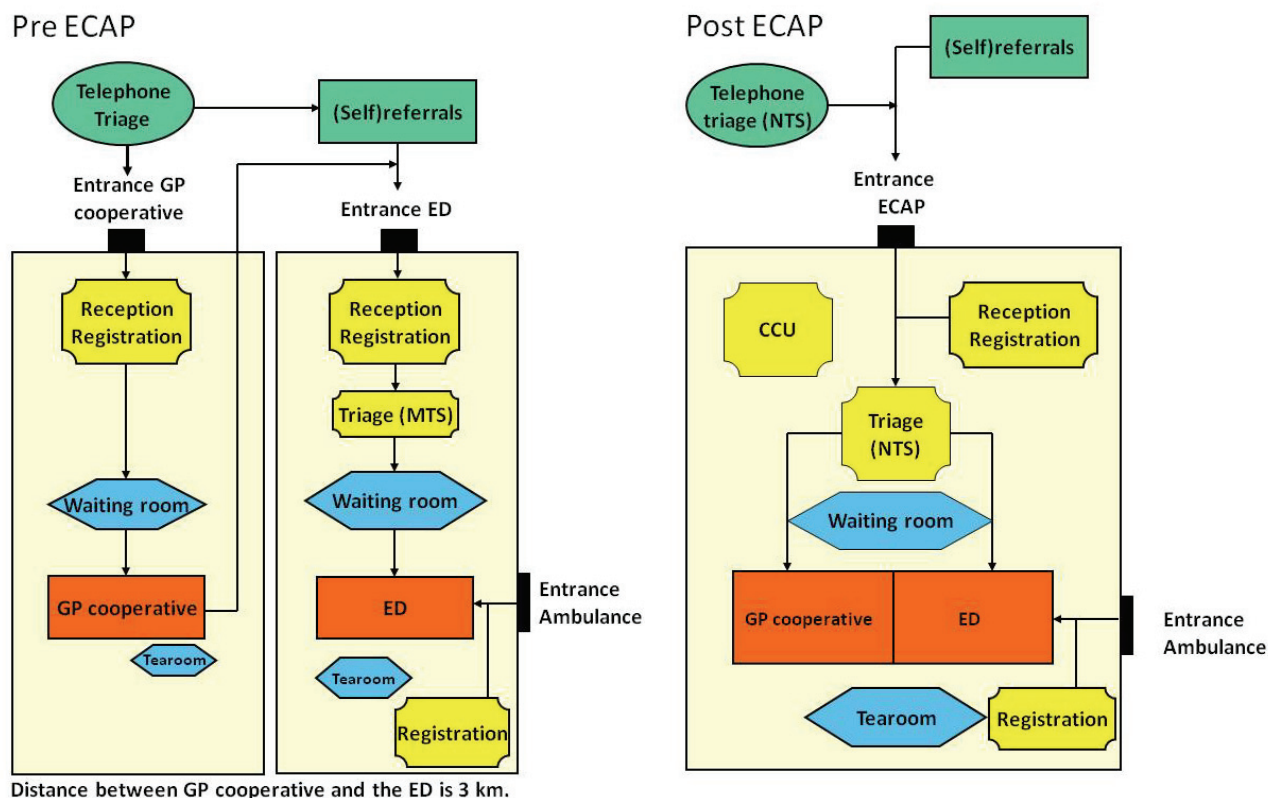
Organising after-hours care is an important challenge in many countries. After-hours care is provided between 5 p.m. and 8 a.m., on weekends and national holidays. In most western countries, emergency departments (EDs) are confronted with overcrowding, while general practitioners (GPs) are not all easily accessible, especially after hours. Differences in national healthcare systems have a noticeable effect on redirecting patients to primary care services. In the United States, studies show an increase of 23–27% in ED visits between 1997 and 2008.^{1,2} Simultaneously, delivering primary care access after-hours decreased from 40% of the GPs in 2006 to 29% in 2009 and different models exist.^{3–5} In western Europe, the GP plays a significant role in providing after-hours care, with 77% of the GPs in Italy, 89% in the UK, and 97% in the Netherlands providing after-hours arrangements.³ Across Europe, different models of after-hours primary care exist, varying from local rotation groups to large general practitioner cooperatives (GPCs).^{6,7} Despite good primary care access, high and rising ED visits are also an issue in Europe.⁸

In the Dutch healthcare system, precise numbers are lacking, but an estimated average of 1.9–2.1 million patients visited the ED per year between 2004 and 2008, with 135 treatments per 1000 inhabitants per year.⁹ The GP is the coordinator of access to the hospital specialist for the majority of emergency care. Primary care is provided 24 hours a day, 7 days a week. It is always free at the point of entry, while patient copayments are required for visits to the ED. During office hours, GPs provide patient care in their office-based practices, including emergency care. Patients can contact their GP through the practice phone number for a telephone advice, a consultation or a home visit. Self-referred patients, who present to the ED during office hours and who are eligible for a GP consultation, are given the option to contact their own GP for an appointment. If they insist on receiving medical care in the ED, they are registered for treatment in the ED. The organisation of after-hours primary care has changed in recent years from rota groups to GPCs, mainly to reduce GPs' workload and also to improve the quality of after-hours care. Since 2000, large-scale GPCs have emerged in the Netherlands, with around 130 GPCs serving the Dutch population of nearly 17 million inhabitants.^{6,9,10} Nonetheless, there is a rise in self-referrals to the ED, because patients can still choose to visit the ED directly and bypass the GPC. To enhance efficiency, decrease overcrowding and costs of after-hours care by redirecting the patient that does not need hospital care to the GP, an organisational model has been proposed that integrates the GPC and the ED into a co-location with one emergency care access point (ECAP), Figure 1.

At this integrated emergency care access point (ECAP), triage will determine whether patients will be seen by a GP or by a physician in the ED. Only a few integrated models exist at this point. Influenced by local successes, several GPCs and EDs are planning to integrate in the near future. Despite the growing interest, little is known of the ECAP effect on flow of ED patients and their

planned follow-up. Several small studies over a short period show different results varying from no flow change to a shift of 15–53% of patients from the ED to the GPC.^{11–20}

Figure 1. Pre ECAP and Post ECAP setting



^a The GP can order blood tests during ECAP hours and order X-rays until 10 p.m., without referring the patient to the ED. This is similar to office hours.

In our study, we took advantage of a natural organisational change, which occurred in the south east region of the Netherlands. The local GPC integrated with the ED of an inner city hospital during after-hours care, creating a co-location with one emergency care access point.

The objective of this study was to examine the effect of an ECAP on ED utilisation and planned patient follow-up. We expected that a large part of the self-referrals could be redirected to the GPC, leading to a decrease in ED utilisation. Furthermore we expected an increase of hospital admissions and out-patient clinical follow-up, since the GP is more likely to refer patients to the co-located ED than to another hospital.

MATERIALS AND METHODS

We conducted a longitudinal observational study in an integrated after-hours care model between an urban emergency department (ED) and a general practitioner cooperative (GPC) in the southeast region of the Netherlands, serving a population of around 325.000 people. In this

model, the ED and the GPC, who formerly worked separately, now integrated forming a co-location with one emergency care access point (ECAP), (Figure 1). To determine the ECAP effect on the trend of ED patient flows, we compared routinely collected ED data three years before and three years after the implementation of the ECAP. Since there is no co-location during office hours, meaning that patients can bypass the GP, we also collected ED data during non-ECAP hours to see overall changes in trends. We hypothesised an increase in GPC patients and, therefore, also collected GPC data to analyse changes before and after the ECAP implementation. The medical ethical committee of the hospital granted institutional review board exemption.

Organisational changes

Before the study, the ED and the GPC were located in different areas in the city, three kilometres apart. Although patients were encouraged to contact the GPC first, they could choose to visit the ED on their own initiative. The collaboration of the ED and the GPC to form an ECAP with one triage system in December 2008 changed this. It meant a difference in the routing of the patient after-hours because the patient could no longer willingly bypass the GP (Box 1).

Box 1. Features of an integrated GPC and ED (ECAP)

- | | |
|-------|--|
| i. | One entrance with one desk for both GPC and ED patients |
| ii. | Preferred access via a single regional telephone number |
| iii. | Access daily from 5 p.m. till 8 a.m. and on weekends and national holidays |
| iv. | Trained chauffeurs in recognisable fully equipped GPC cars for home visits |
| v. | ICT support including electronic patient files and electronic feedback to the patient's own GP |
| vi. | Triage nurses (GPC or ED nurses) in contact by telephone and on side |
| vii. | GP shifts of 6-8 hours |
| viii. | Ambulance patients are directly seen in the ED |

The ECAP is open from 5 p.m. till 8 a.m. during weekdays, the weekend, and national holidays. As before the change, patients are encouraged to phone the GPC first via a regional telephone number, when they seek medical help during ECAP hours. The after-hours change into an ECAP and the ways to contact the GPC were promoted by flyers in the ED, GPC and in waiting rooms of both the hospital and all regional GPs and by advertisements in local newspapers, prior to the implementation. A call center for the regional telephone number is co-located with the ECAP and is manned by telephone operators who are trained in using the Netherlands Triage Standard (NTS) to determine patient urgency. NTS is a triage system that is developed and validated in the Netherlands to work for the ambulance services, GPCs, and EDs.²¹ It determines the urgency, type of medical advice (consult, home visit, or telephone advice) and type of healthcare provider (ambulance, GP, or ED). A GP at the call center supervises all phone calls. Depending on the complaint and telephone triage outcome, patients will either receive a telephone advice, an appointment with a GP at the ECAP, a GP home visit or they will be directly referred to the ED. If necessary, the ECAP can send out an ambulance as well. Independently of the ECAP, there is also

the national emergency phone number, 112, that patients can phone 24/7, to request an ambulance. Self-referred patients who do not phone and turn up at the ECAP are registered and triaged with NTS by a trained triage nurse. Depending on their triage outcome, patients either receive a scheduled appointment at the GPC or are directly referred to the ED. The GP supervises the triage nurse; therefore, all patients that are directly referred to the ED after triage are registered as GP referrals. Patients who have been treated by a hospital physician either in the outpatient clinic or through a hospital admission, within three months prior to presenting at the ECAP, were automatically referred to the ED and registered as a return visit. This was a local agreement between GPs and hospital physicians prior to the start of the ECAP. The GP can request simple blood tests 24/7 and X-rays until 10 p.m., without having to refer the patient to the ED, similar to office hours.

Study setting

The studied ED is the only ED in the city and is situated just outside the city centre, serving the major part of the city and the northern region outside the city. There used to be another hospital with a small ED that closed down in August 2008, during the time frame of our study, three months before the study intervention.

The GPC is a large cooperation that has three locations in the region, serving 510.000 people. Two locations are outside the city. The studied GPC in the city was initially located three kilometres from the ED before integrating.

Measures

For the ED, we gathered data from the CS-EZIS system, Chipsoft BV, which is a computerised system routinely used for real time management of patients. Every patient that presents to the ED is registered in this system. We collected clinical data of the ED, covering a six-year period from 2006 to 2012, three years before and three years after the start of the emergency care access point (ECAP). Because the ECAP started on 1 December 2008, we considered this a transition month and did not include this month in our data. For comparison reasons, we therefore also excluded data from December 2011, making the pre ECAP period and the post ECAP period equal, namely 35 months.

For the ECAP hours, we collected patient characteristics as gender and age. For patient origin, the EZIS system has 7 categories: self-referral, GP referral, ambulance referral, return visit, outpatient clinical referral, radiology referral (e.g. a proven fracture), and referrals from another hospital.

We also collected data about the next clinical step after the ED visit, where the EZIS system also has 7 categories: no follow-up, GP follow-up, outpatient clinical follow-up, hospital admission, transfer to another hospital, left without being seen, and either died in the ED or brought in

dead. We also collected absolute ED patient numbers from non-ECAP hours to look at the overall trend of ED visits. Finally we collected regional GPC data on the number of ECAP visits, telephone advice, and home visits before and after the start of the ECAP.

Data Analysis

For the comparison of descriptive characteristics of patients before and after the start of the ECAP, we used the chi-square test. We calculated numbers and percentages. A logistic segmented regression analysis was performed to test the changes after implementation of the ECAP as shown in Figures 2 and 3. This method estimates separately the change over time before the intervention, the direct effect of the intervention itself, and the change over time after the intervention. $P < 0.05$ was considered significant. Outcome variables were self-referrals versus non self-referrals and an outpatient clinical follow-up contact versus no clinical follow-up contact (the combined categories of no follow-up contact and a GP follow-up contact). The regression model controlled for the effect of age and gender. We used SPSS 19.0 for our statistical analysis. The following categories were used: hospital admission, outpatient clinical follow-up and no outpatient clinical follow-up (GP follow-up or no follow-up combined). Two periods were distinguished: before the start of the ECAP (1 January 2006 until 1 December 2008) and after the start of the ECAP (1 January 2009 until 1 December 2011), 35 months in each period.

RESULTS

During non-ECAP hours, a total of 94.778 patients attended the ED, 44.190 in the period before the start of the ECAP and 50.588 after the start, an increase of 14%. During ECAP hours over the same period, a total of 110.696 patients attended the ED, 59.182 ED patients before the start of the ECAP and 51.513 patients after the start, an overall decrease of 13%. During ECAP hours, the majority in both groups, pre- and post-ECAP, were males, 54.5% and 52.1%, respectively. The mean patient age shifted from 39 to 44 years old. The percentage of total ED patients in younger age groups (0–49 years) decreased and older age groups (50 and older) increased with 9.3%. The group of 65 and older increased by 16.2%. The majority of patients presented to the ED in the evening between 5 p.m. and 11 p.m. (51.7% and 49.6%). All changes were significant (Table 1).

Figure 2 shows that in the post-ECAP period, the number of ED self-referrals decreased by 99.5% (36.139 versus 181), GP referrals increased by 213.4% (10.876 versus 34.089) and the number of patients brought in by ambulance increased by 3.2% (6.244 versus 8.222). The logistic segmented regression analysis showed a slight decrease in self-referrals before the introduction of the ECAP (OR 0.997; 95% CI 0.995–0.999). After the intervention, there was an instant, considerable decrease in self-referrals (OR 0.003; 95% CI 0.002–0.004).

Table 1. After-hours ED patient characteristics; numbers and percentages of patients, total of 3 years before and 3 years after the start of the ECAP

	Before 2006 -2008 ^a		After ^e 2009-2011 ^a	
	N	%	N	%
Total non ECAP hours N=94.778	44.190	--	50.588	--
Total ECAP hours N=110.696	59.182	100	51.513	100
Gender				
Male	32.283	54.5	26.843	52.1
Age in years				
1-17	13.873	23.4	10.264	19.9
18-29	10.701	18.1	7.591	14.7
30-49	13.698	23.1	10.674	20.7
50-64	8.604	14.5	8.679	16.8
65-84	10.698	18.1	11.980	23.3
≥ 85	1.608	2.7	2.325	4.5
Time of visit				
8 a.m. – 5 p.m. ^b	16.285	27.5	14.304	27.8
5 p.m. – 11 p.m. ^c	30.575	51.7	25.571	49.6
11p.m. – 8 a.m. ^d	12.322	20.8	11.638	22.5

^a Excluding December 2008 and December 2011, ^b weekend days and national holidays, ^c 7 days a week, ^d 7 days a week, ^e all changes are significant after the ECAP using chi square testing.

After the start of the ECAP, both hospital admissions, 14.854 versus 17.827, as well as outpatient clinical follow-up, 18.003 versus 19.047, increased with 20.2% and 5.8%, respectively. There was a decrease of 46.4% in ED patients referred back to their GP for follow-up or who did not need follow-up at all, 24.896 versus 13.342 (Figure 3). The regression analysis showed that the number of outpatient clinical follow-up contacts and hospital admissions decreased before the introduction of the ECAP (OR 0.993; 95% CI 0.991–0.995). Directly after the introduction of the ECAP, the number of follow-up contacts increased (OR 1.968; 95% CI 1.870–2.071) and the trend changed from less contacts to more contacts (OR 1.015; 95% CI 1.013–1.017). All changes were significant.

Table 2 shows the effect of the closing of the other city's ED 3 months prior to starting the ECAP. There is an average increase of 430 ED patient visits per month (31.9%). There was no noticeable change in percentage of self-referrals (59.2% and 60.1%) or GP referrals (18.4 and 20.2%). The increasing trend of no/GP follow-up (5.2% and 1.8%) and decreasing trend of hospital admission (2.6% and 2.0%) remained unchanged after the closing.

Table 2. Effect of the closure of another city ED on patient numbers and percentage on the researched ED

	Patient	N	Origin				Follow-up	
			Self-referral	GP referral	Ambulance	No/GP follow-up	Hosp. admissions	Out patient clinic
			Mean %	Mean %	Mean %	Mean %	Mean %	Mean %
^a	ECAP							
2006	Before	4697	59.2	19.2	10.6	37.7	27.9	32.5
2007	Before	4902	59.8	18.4	9.8	42.9	25.3	29.5
2008	Before	6193	60.1	20.2	12.0	44.7	22.3	29.5
2009	After	4307	0.5	67.0	17.0	27.1	33.1	37.7
2010	After	4110	0.2	65.3	15.8	25.1	35.6	36.6
2011	After	4399	0.4	62.9	16.9	22.7	37.9	37.1

^a Each year contains a three-month period covering September, October and November. In the before period, the ECAP had not been implemented and the ED closure in 2008 is the only regional change in the emergency healthcare setting. In the after period the ECAP is implemented as well.

Table 3 shows that after implementing the ECAP, the total number of patients having contact with the GPC increased by 30% (330.162 versus 412.545). Patients receiving a consult at the regional GPC increased by 26.0% (183.782 versus 232.246) and patient home visits decreased by 14.3% (33.618 versus 28.818).

Table 3. Patient numbers at the regional GPC before and after the ECAP (after-hours)

Total Year	Pre ECAP				Post ECAP				Total
	2006	2007	2008	Sub Total	2009	2010	2011	Subtotal	
Telephone advice	33.866	37.485	41.411	112.762	52.541	48.481	50,459	151.481	264.243
GPC consultation	58.062	62.345	63.375	183.782	77.875	77.812	76,559	232.246	416.028
Home visit	10.773	11.385	11.460	33.618	10.741	9.156	8,921	28.818	72.436
Total	102.701	111.215	116.246	330.162	141.157	135.449	135.939	412.545	752.707

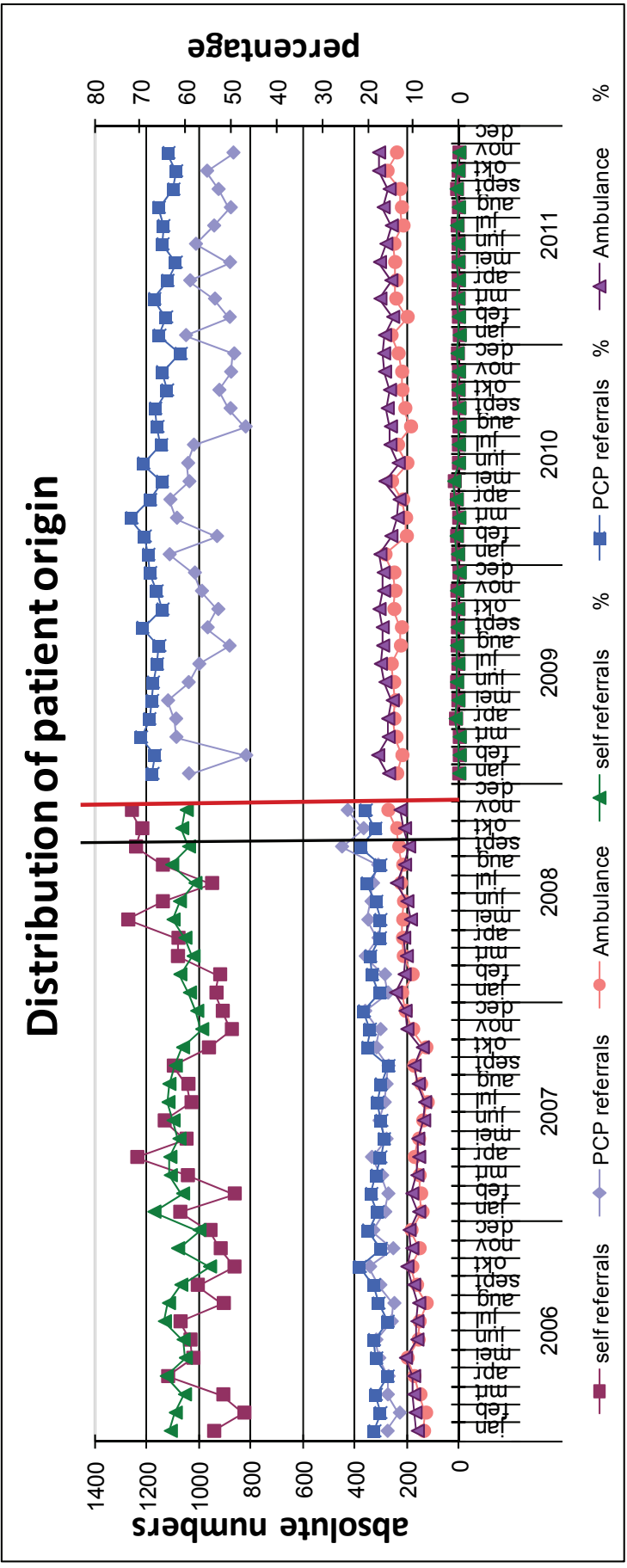
The regional GPC consists of three GPCs including the studied GPC. Separate GPC data is not available since it is not registered as such.

Limitations

With the implementation of the ECAP, the triage system changed from the Manchester triage system (MTS) to the Netherlands triage standard (NTS), and both systems are not comparable. We therefore had to look at hospital admissions and outpatient clinical follow-up for comparison of patients acuity.

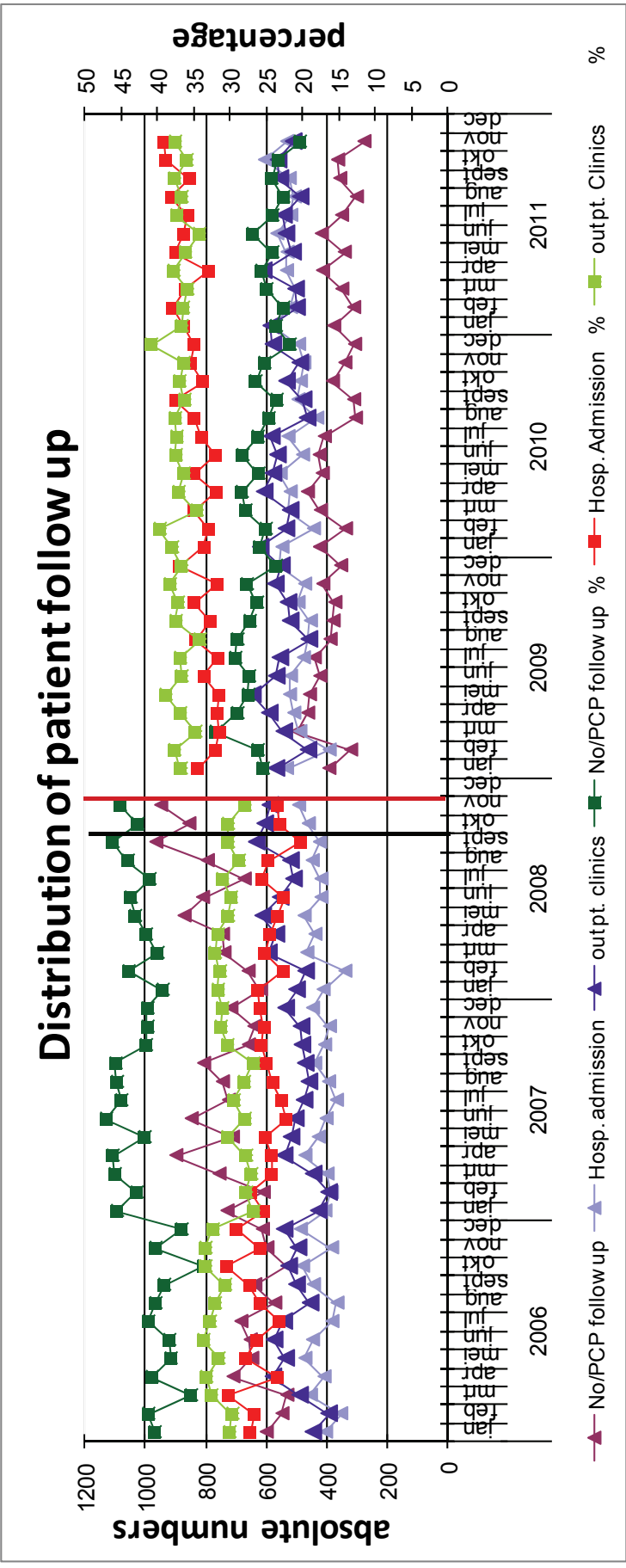
Three months before the organisational change, the only other emergency department in the city closed. This led to a shift in patients spreading out over other hospitals in the region, including the studied ED, and this might have affected total patient numbers but should not have had an effect on trends.

Figure 2. Distribution of patient origin



For visual reasons the percentage of revisits, referrals from outpatient clinics or other hospitals is not shown in this figure
black line=ED closing, red line=opening ECAP

Figure 3. Distribution of patient follow up



For visual reasons the percentage of deceased in the ED and transfer to another hospital is not shown in this figure. These percentages are very low and remained unchanged.
black line=ED closing, red line=opening ECAP

The observational design implies that factors outside the ECAP may have contributed to the results. The study used data that were retrospectively analysed. This study took advantage of a naturally occurring change in a large geographical area, but its relevance for other settings has to be considered.

DISCUSSION

The implementation of an ECAP led to a decreased ED utilisation, with almost no self-referring patients and an increase in ED patients with a hospital admission or planned outpatient follow-up. These findings suggest that fewer patients but with a higher acuity attended the ED after the start of the ECAP.

This is one of the first long-term studies to observe the changes in attending ED patients after implementing an ECAP, so it is difficult to compare it with available literature. We found a patient reduction of 13% after the start of the ECAP. It is plausible to assume that patient numbers would have followed the same trend after hours as during office hours (14% increase), had the ECAP not been implemented. The total effect of the ECAP would thus be a decrease of 27% of patients attending the ED. Earlier pilot studies, with short follow-up periods, found a shift of low acuity patients, mostly self-referrals, from the ED to the GPC varying from 15% to 53%.¹³⁻²¹ Although we could not compare triage outcome, our data supports these findings, since the overall ED patient decrease in our study is mostly due to the shift of the younger, male patients, which is typically the low acuity self-referral. In referred patients the increase of 213% we found is much higher compared to other studies.¹⁵⁻²¹ Several factors might have contributed to that increase difference, for instance the closing of the other ED, although overall patient numbers do not seem to imply that. It is more likely that, in contrast to most other studies, the patients in our study cannot bypass the GP and visit the ED directly. Furthermore, the protocol to refer every patient, who has been admitted or seen in the outpatient clinic for similar presenting complaints within the previous three months, is likely to lead to higher referral numbers. Decreasing this arbitrary 3-month period could further decrease the number of patients being referred. With respect to patient follow up, we found an increase of 20.2% in hospital admissions. This differs from the decrease found in a smaller Dutch study and the 0.2% decrease found by Andersson in a study that was also confronted with closing EDs in the region.^{17,18} An explanation could be that starting an integrated ECAP is likely to increase the adherence with more GP referrals to this specific hospital. It is also likely that the GP has a lower threshold to refer patients to the ED next door rather than transporting to another ED. Similarly, the ED physician is likely to have a lower threshold to admit patients being referred by a GP compared to the self-referral. Apart from the increasing aging patient with comorbidities, this trend of increasing hospital admissions could be due to the ongoing development of rapid diagnostic technologies, early treatment availability, and public education campaigns in recognising heart attacks and strokes.²²

Similar to a previous study in the Netherlands, we found an increase in number of patients staying within one setting for follow-up.²³ These previous studies show an increase as well as a decrease of outpatient clinical follow-up after an ED referral.^{17,23}

Across the world, policy makers are looking for the optimal organisation of emergency care.^{5,8,24,25} This study suggests that high involvement of primary care providers in emergency care can optimise the efficiency of ED utilisation. Patients with serious conditions benefit from the facilities and skills at the ED, while patients with less serious conditions are treated in a primary care setting, reducing ED crowding. The high number of patients receiving planned clinical follow-up might indicate potential for further efficiency gains. Further research is also needed to examine health outcomes in patients attending the ECAP and receiving either primary care or treatment at the ED.

Conclusion

In summary, the introduction of a regional integrated ECAP in one region in the Netherlands was associated with substantial changes in the flow of patients, including an overall decrease in ED utilisation, an almost disappearance of self-referring ED patients, and a higher probability of hospital admission and clinical follow-up at the ED. The latter suggests that either the proportion of patients presenting to the ED with a higher acuity increased or the threshold of admitting referred patients is lower than that of the self-referred patients. The integrated model for emergency care, in which the GP is the first point of contact for patients, works well for the Netherlands. Differences across healthcare systems and after hours primary care models make it somewhat difficult to predict whether this also applies to other settings, but we suggest that it works well in countries with a well-developed primary care sector.

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Chapter 6

Co-location of hospital emergency departments and GP cooperatives in the Netherlands, an observational study

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ABSTRACT

Objective

In the Netherlands GP-practitioners increasingly collaborate with emergency departments (EDs). In this setting, insight into ED care pathways and their links with length of stay (LOS) is limited.

Methods

Observational multicenter study of 7000 ED patient records from 1st February 2013. Seven EDs throughout the Netherlands were included, three with and four without an integrated GP cooperative (GPC), forming one Emergency-Care-Access-Point (ECAP). We explored differences in characteristics and care pathways and their link with LOS.

Results

Mean age of ED patients was 47 years, 51.9% was male and 36.3% required a hospital admission. Compared to non-ECAP EDs, patients at ECAP EDs were older (47.6 versus 42.1 years), had a higher referral rate (74.1% versus 49.1%) and a higher admission rate (42.7% versus 31.7%). Median ED LOS was 130.0 minutes (IQR 79.0-140.0), increasing with patients' age. Random coefficient regression analysis showed LOS for patients referred by medical professionals was 32.9 minutes longer compared to self-referred patients (95%CI; 27.7-38.2 min). LOS for patients admitted to hospital was 41.2 minutes longer compared to patients followed-up at the outpatient clinic (95%CI; 35.3-46.6 min) and 44.6 minutes longer compared to patients who did not receive follow-up (95%CI; 38.3-51.0 min). There was no difference in LOS between hospitals with or without an ECAP.

Conclusions

ECAPs have an influence on ED characteristics and care pathways with older patients, more referrals and higher admission rates, all factors associated with a longer LOS in this study. With 130 minutes, though, the median LOS in Dutch EDs is relatively short.

INTRODUCTION

In the Netherlands, primary healthcare is well-developed and accessible for patients 24 hours a day. During office-hours patients can present at their own general practitioner practice, usually on the same day. After-hours, general practitioners provide emergency services through large scale GP cooperatives.¹ Patients can contact a GP cooperative (GPC) by calling a regional telephone number. Depending on the complaint, they either receive a consultation at the GP cooperative, a home-visit or self-care advice. In case of life-threatening complaints the GP can send out an ambulance. All calls are supervised by GPs. At emergency departments (EDs), patients present after being referred, either by own transport or they are brought in by ambulance. Patients can also bypass their GP and attend the ED on their own initiative. To reduce healthcare costs and redirect this self-referred patient to primary care, there is an increasing trend towards implementing Emergency Care Access Points (ECAP). This is a place where EDs and GPs work together, creating one desk where triage decides if the patient will be seen by a GP or in the ED.² In this setting, the GP serves as a gatekeeper for emergency department visits. The ECAP has led to a decrease of self-referred ED patients and changed the acuity and admission rates of presenting ED patients.³⁻⁷ With increasing numbers of ECAPs implemented in the last decade, patient characteristics and care pathways at EDs in the Netherlands, are likely to have changed. The available data however, are mostly pilot studies and describe local changes in a before and after implementation study. The overall characteristics of EDs in the Netherlands, comparing EDs with and without an ECAP, are unknown. Furthermore, there is no data available of the effect of these different care pathways on length of stay. Non-urgent visits as well as influenza season and hospital bed shortages are some of the factors that have been identified as causes for crowding.⁸ With non-urgent ED visits associated with ED crowding, policies to redirect these patients to primary care, as seen at ECAPs, might contribute to a reduction of LOS. Especially with increasing lengths of stay being associated with decreased patient satisfaction, treatment delays, patients leaving without being seen and ambulance diversions, insight in the influence of ECAPs on LOS is important. Despite increasing numbers of ECAPs, there was no research available that looked at characteristics and care pathways (origin and destination) of ED patients and comparing EDs with and without an ECAP.

This study aimed to provide insight in ED patient characteristics and care pathways in the Netherlands, explore differences in EDs with and without an ECAP and their links with LOS.

METHODS

Study design and setting

This was an observational multicenter study of 7000 patient records of EDs in the Netherlands. To make sure our data represented overall Dutch EDs, patients were sampled from seven EDs throughout the Netherlands, including small urban EDs, large inner city EDs and EDs with and without an ECAP. ECAPs are open from 5pm to 8am on weekdays, on weekends and bank

holidays. The patient samples comprised the first 1000 patients attending the ED, from February 1st 2013 onwards. Patients who were registered in the ED system, but received healthcare at the GP cooperative, an outpatient clinic or directly went to the obstetric ward or the cardiac emergency department, were therefore excluded. The medical ethical committee granted institutional review board exemption.

Methods and measurements

All hospital EDs had digital registration systems, and the extracted data were numbered and anonymously put in a database. A standardised format was provided to each hospital to ensure that the provided data was comparable. The participating hospitals provided descriptive information regarding the use of a triage system, total annual ED admission over 2012 and the presence of an ECAP. Furthermore, descriptive data was collected, regarding the number of hospital beds, total annual hospital admissions, mean length of hospital stay and the adherence area when available.

Besides origin (self-referred, referred by GP, ambulance, via the radiology department, other) and destination (admitted to hospital, out-patient clinical follow-up, GP follow-up, no follow-up and other) the measures included: date and time of arrival and departure, sex, age, acuity (triage category), trauma or non-trauma related and LOS.

Patients who were referred by a GP and arrived by ambulance comprised a separate category registered in the different digital systems. Depending on individual hospital systems, they could either be in the GP group or in the ambulance group. We therefore combined the two groups and classified these patients as referred by medical professionals. During office-hours, GPs in the Netherlands have the option to refer patients directly to the radiology department for a diagnostic work-up (x-ray or ultrasound). Some ECAPs also have this option after-hours. A radiologist reads the obtained images and either refers the patient to the ED when abnormalities are found or back to the GP. Because this is a common procedure in the Netherlands, patients attending the ED via the radiology department were separately categorised. Furthermore, we expected a shorter ED LOS for this group.

Outcomes

The primary outcome was origin (self-referred patients, patients referred by medical professionals and patients referred by the radiology department) and follow-up (hospital admission, follow-up at the out patient clinic, follow-up with the GP or no follow-up) as well as comparing ECAP EDs with non-ECAP EDs. Secondary outcome was LOS and the association with different care-pathways.

Analysis

Data was checked for integrity and entered in a database. Missing data and outliers, were checked with the contact person of the specific hospital, corrected if needed and added to the database. For data analysis we used IBM SPSS Statistics Version 19. Descriptive statistics (totals, medians, 95% CI, interquartile range) were used to describe patient characteristics, care pathways and LOS. We explored whether patient's LOS was related to origin, follow-up, time of presentation and the presence of an ECAP. Because the ECAPs only operate after-hours, we analysed LOS comparing ECAP and non-ECAP hospitals only in the after-hours period.

Random coefficient regression modeling was used to explore links of LOS with patients' age, sex and whether or not patients presented with a trauma related problem. These patient-related measures were included as fixed effects. In a separate regression model we explored the links of LOS with time of presentation, origin, follow up and the presence of an ECAP both separately and combined with age, sex and a trauma related problem (all as fixed factors). Hospital was included as a random factor for all analysis except for the ECAP analysis. P-value < 0.05 was considered significant.

RESULTS

Hospital characteristics

The seven participating hospitals were spread over the country, varied in size, and included the two largest urban EDs of the Netherlands (one with and one without an ECAP; Table 1).

Table 1. Hospital and ED characteristics

	Overview Hospitals							Total
	Hospital 1	Hospital 2	Hospital 3	Hospital 4	Hospital 5	Hospital 6	Hospital 7	
Urbanisation	Urban	Urban	Innercity	Urban	Urban	Innercity	Urban	--
Geographic region	Middle	South-west	North-West	Middle	South	West	South-East	--
Population served	460.000	500.000	n/a	n/a	250.000	n/a	280.000	--
Hospital beds ^b	955 ^c	545	555	663	696	654	479	479-955 ^c
Total admissions ^b	26.784	26.957	26.022	31.563	28.988	38.861	23.553	202.728
ED admissions of total hospital admissions (%) ^b	46.2	35.9	30.1	28.6	38.0	32.0	38.0	35.2
Mean length hospital stay (days) ^b	5.4	5.1 ^a	5.0	4.5 ^a	4.8	4.3	4.9	4.3-5.4
ED Total patients per year ^b	36.721	28.234	48.978	24.365	32.132	43.362	26.661	240.453
Total of ED admissions ^b	12.383	9.678	7.822	9.030	11.027	12.449	8.961	71.350
ED admissions of total ED presentations (%) ^b	33.7	34.3	16.0	37.1	34.3	28.7	33.6	29.7
EP present 24/7	Yes	Yes	No	Yes	No	No	No	-
ECAP	No	No	No	Yes	Yes	Yes	No	-
Triage System	MTS	ESI	ESI	MTS	NTS	MTS+	MTS	-

^a N/A in year report, calculated (Known admissions and length of hospital stay), ^b table presenting numbers of the year 2012 ^c also includes daycare beds. MTS stands for Manchester triage system, ESI for Emergency Severity Index and NTS for Netherlands Triage Standard.

Three hospitals were tertiary cardiac referral centers that performed primary cardiac interventions (PCI). One hospital was a level one-trauma center and three hospitals had 24/7 emergency physicians staffed. All hospital EDs were open 24/7. Together the hospitals treated 240,453 patients in their EDs in 2012, of which 71,350 patients were admitted to the hospital. This equals an admission rate of 29.7% of all ED attendances and makes up 35.2% of total hospital admissions. The average length of hospital admissions ranged from 4.3 to 5.4 days.

Three different triage systems were in use: the Manchester Triage System (MTS), Emergency Severity Index (ESI) and the Netherlands Triage Standard (NTS). There were three hospitals with an ECAP and four without an ECAP.

Patient characteristics

Of the 7000 included patients, 51.9% was male and the mean age was 47.0 (median 49.0, SD 25.6, Table 2). The majority of patients presented during weekdays (41.9%). Of all ED attendances, 32.0% presented with a trauma related problem. Overall, 36.3% of ED attendances were admitted to the hospital, 28.5% were followed up at an outpatient clinic, 9.3% were referred to their GP for follow-up and 20.7% did not require any follow-up.

Table 2. Patient characteristics and care pathways (n=7000)

		Mean of all hospitals	Lowest-highest value per hospital
Male (%)		51.9	48.4 – 56.2
Age (%)	0-5 years	7.0	1.7 – 9.5
	6-18 years	9.3	5.6 – 10.5
	19-30 years	14.8	11.1 – 20.6
	31-50 years	20.8	17.0 – 26.0
	51 – 65 years	19.9	18.0 – 22.1
	66 – 85 years	23.1	12.0 – 26.8
	> 85 years	5.1	3.0 – 8.4
Presentation (%)	5 Weekdays ^b	41.9	37.3 – 50.4
	7 Evenings ^c	30.0	28.5 – 31.9
	7 Nights ^d	13.1	12.2 – 15.0
	2 Weekend days ^b	15.0	7.1 – 19.6
Origin (%) ^a	Self-referred patients	21.2	9.4 – 51.2
N=6908 ^e	Referred by medical professionals ^f	59.9	38.3 – 77.2
	Referred by the radiology department	3.3	3 – 4.8
Follow-up (%) ^a	Hospital Admission	36.3	18.5 – 43.5
	Out patient Clinic	28.5	15.7 – 36.4
	General Practitioner	9.3	1.9 – 39.5
	None	20.7	9.0 – 26.1
Trauma (%)		32.0	25.4 – 36.0

^a Does not add up to 100% due to other options not shown in the table ^b 8 a.m.-5 p.m., ^c 5 p.m.-12 a.m., ^d 12 a.m.-8 a.m., ^e there were 92 missing data on patients origin, ^f includes ambulance and GP referred patients.

The mean age for self-referrals was 37.5 years and 51.6% presented with trauma related symptoms (Table 3).

Table 3. Characteristics of patient groups

		Self-referrals (N=1877)	Referrals	
			Medical Professionals (N=4138)	Radiology Department (N=230)
N=6.245 ^a				
Total (%)		21.2	59.9	3.3
Male (%)		57.5	49.6	50.0
Age (%)	0-5 years	6.2	8.0	2.2
	6-15	8.6	4.6	18.3
	16-30	29.6	13.2	16.1
	31-50	26.5	18.5	19.6
	51 – 65	16.6	20.5	23.5
	66 – 85	10.8	28.4	15.2
	> 85	1.7	6.8	5.2
	Presentation (%)	Weekday ^b	38.0	40.9
Evening ^c		31.5	30.9	4.8
Night ^d		14.2	14.1	1.3
Weekend day ^b		16.2	14.1	1.3
Follow-up (%) ^a	Hospital Admission	11.4	48.9	3.5
	Out patient Clinic	29.4	24.4	75.6
	GP Follow-up	18.6	6.2	3.0
	No Follow-up	31.6	17.5	12.2
Trauma (%)		51.6	23.4	89.6
Median LOS (minutes)		99.0	148.0	71.5
N = 4070 ^g		ECAP (N=1785)	Non-ECAP (N= 2285)	
Male (%)		51.9	53.1	
Age (%)	0-5 years	6.8	8.9	
	6-15 years	4.4	7.6	
	16-30 years	19.4	22.3	
	31-50 years	21.2	21.8	
	51 – 65 years	19.3	17.5	
	66 – 85 years	23.7	17.9	
	> 85 years	5.3	4.0	
	Time of presentation	Evenings ^c	49.9	53.0
Nights ^d		23.1	22.1	
Weekend days ^b		27.0	24.9	
Self-referred patients		15.6	38.7	
Origin (%)a	Referred by medical professionals ^f	74.1	49.1	
	Referred by the radiology department	0.5	0.4	
Follow-up (%) ^a	Hospital Admission	42.7	31.7	
	Out patient Clinic	27.7	26.7	
	General practitioner	5.0	13.3	
	None	21.0	23.2	
Median LOS (Minutes)		129.0	118.0	
Trauma (%)		28.8	35.8	

^a Does not add up to 100% due to other options not shown in the table ^b 8 a.m.-5 p.m., ^c 5 p.m.-12 a.m., ^d 12 a.m.-8 a.m., ^e there were 92 missing data on patients origin. ^f Includes ambulance and GP referred patients ^g N during opening hours ECAP.

A total of 11.4% required hospital admission. The mean age for patients referred by medical professionals was 50.9 years, 23.4% presented with trauma related symptoms and 48.9% required an admission.

At ECAP EDs the mean age was 47.6 years compared to 42.1 years at non-ECAP EDs. At ECAP EDs 74.1% of patients were referred by medical professionals compared to 49.1% at non-ECAP EDs and 42.7% of patients required an admission compared to 31.7%. During ECAP opening hours, the median LOS in ECAP EDs was 129 minutes compared to 118 minutes in non-ECAP EDs.

Length of stay

The overall median ED LOS was 130.0 minutes (interquartile range across EDs: 79.0- 194.0 min). Figure 1 shows that there was a peak in LOS at the end of the night and a slightly smaller peak at the end of the afternoon. The majority of patients presented in the afternoon between 12 pm and 5 pm.

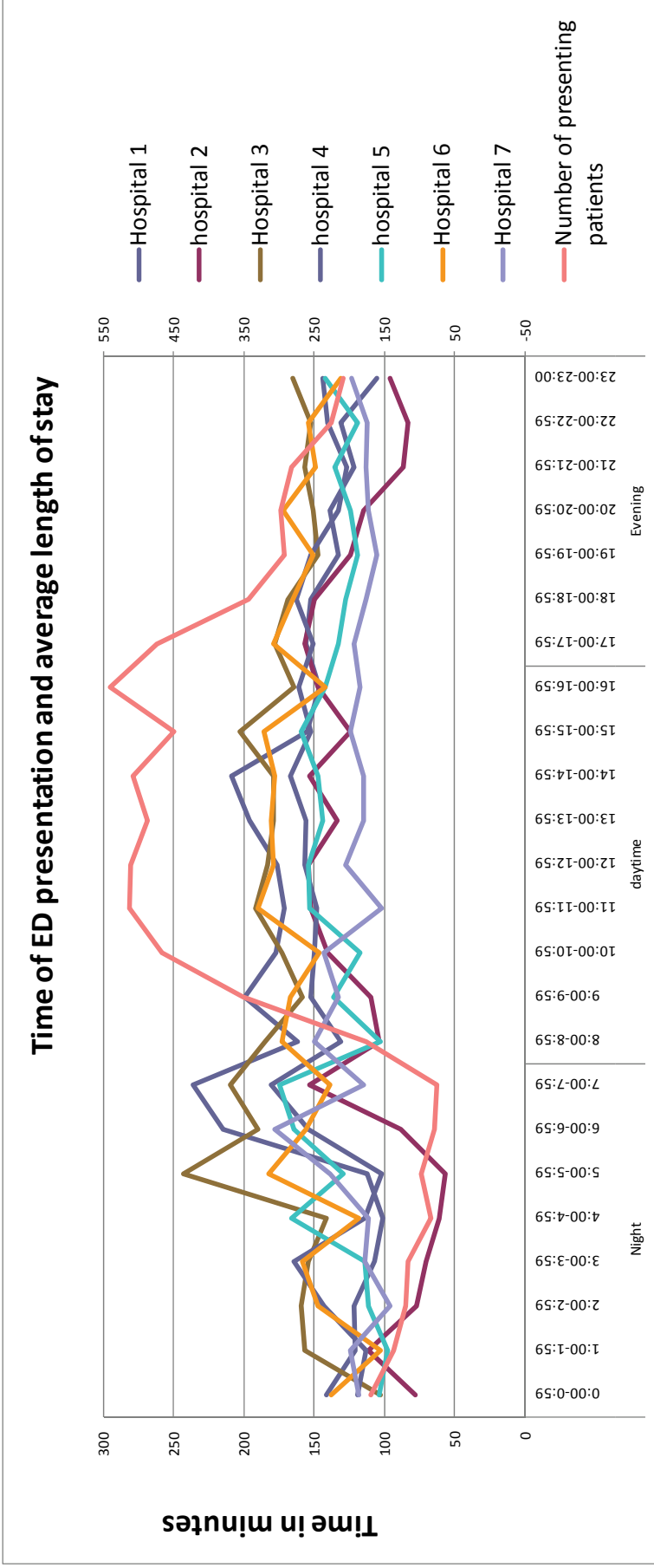
The median LOS was longest for patients presenting with a non-trauma related problem (151 min), patients presenting during week-days (142 min), patients referred by medical professionals (148 min) and patients who were admitted to hospital (169 min). For patients referred by the radiology department the median LOS was shortest with 71.5 minutes (Table 4).

Table 4. Length of stay (LOS) stratified by patient characteristics and care pathways

N=7000		Median LOS (in minutes)	Interquartile range
Overall median LOS		130.0	79.0 - 194.0
Gender	Male	134.5	84.0 - 198.0
	Female	127.0	74.0 - 191.0
Trauma ^a	Yes	91.0	52.0 - 141.0
	No	151.0	99.0 - 215.0
ECAP	Yes	136.0	82.0 - 200.0
	No	125.5	76.0 - 190.0
Time of presentation ^a	Weekdays ^b	142.0	86.0 - 210.0
	Evenings	123.0	77.0 - 176.0
	Nights	116.0	69.5 - 172.0
	Weekend days	126.0	72.0 - 199.0
Origin ^a	Self-referred patients ^b	99.0	54.0 - 154.0
	Referred by medical professionals	148.0	97.0 - 212.0
N=6908 ^d	Referred by the radiology department	71.5	44.0 - 125.0
	Hospital Admission ^b	169.0	120.0 - 238.0
Follow-up ^a	Out patient Clinic	108.0	66.0 - 164.0
	General practitioner	122.0	79.0 - 179.5
	None	93.0	53.3 - 145.0

^a P < 0.05 in the regression analysis, ^b compared parameter in the random coefficient regression analysis ^c Includes ambulance and PCP referred patients ^d There were 92 missing data on patients origin.

Figure 1.



Characteristics of factors associated with different LOS

Of 6908 patients (92 missing data), the median LOS for self-referrals was 99.0 minutes, for referred patients LOS was 148.0 minutes and for patients presented via the radiology department 71.5 minutes.

The random coefficient regression analysis showed that patients presenting with a trauma related problem had a 51 minutes shorter LOS (95%CI: 46.6 – 55.6 min) compared to patients with a non-trauma related problem. LOS increased with age ($P = 0.00$). Compared to presentations during weekdays, LOS was significantly shorter for presentations in the evening (21.1 min, 95%CI: 15.8-26.4), night (25.2 min, 95%CI: 18.1-32.2) and on weekend days (15.8 min, 95%CI: 9.1-22.5). Compared to self-referred patients, LOS was significantly shorter for patients referred via the radiology department (14.9 min, 95%CI: 2.2-22.5) and significantly longer for patients referred by medical professionals (57.3 min, 95%CI: 52.0-62.5). Compared to patients requiring a hospital admission, there was a significantly shorter LOS for patients followed-up in an out-patient clinic (63.8 min, 95%CI: 58.6-69.1), followed-up by their GP (72.2 min, 95%CI: 63.7-80.7) or who did not need any follow-up (71.3 min, 95%CI: 65.2-77.7).

Table 5. Factors associated with LOS^a

	Before including fixed effects ^b				After including fixed effects ^b			
	95% Confidence Interval			P Value	95% Confidence interval			P Value
	Difference in LOS ^c	Lower bound	Upper bound		Difference in LOS ^c	Lower-bound	Upper bound	
Time of presentation								
Weekday ^c	Reference				Reference			
Evening	-21.1	-26.4	-15.8	0.000	-13.1	18.1	-8.2	0.000
Night	-25.2	-32.2	-18.1	0.000	-20.4	-27.0	-13.9	0.000
Weekend day	-15.8	-22.5	-9.1	0.000	-11.0	-17.2	-4.7	0.001
Origin								
Self referred ^c	Reference				Reference			
Referred by medical professionals	57.3	52.0	62.5	0.000	32.9	27.7	38.2	0.000
Referred via radiology	-14.9	-27.6	-2.2	0.022	-6.5	-18.7	5.6	0.293
Follow up								
Hospital Admission ^c	Reference				Reference			
Out patient Clinic	-63.8	-69.1	-58.6	0.000	-41.2	-46.6	-35.8	0.000
GP Follow-up	-72.2	-80.7	-63.7	0.000	-49.9	-58.3	-41.5	0.000
No Follow-up	-71.3	-77.7	-65.2	0.000	-44.6	-51.0	-38.3	0.000

Legend: ^a Results from random coefficient regression modeling, all analysis included hospitals as random effect,

^b fixed effects are age, sex and trauma, ^c difference in LOS compared to the reference category

Regarding the moment of presentation, the LOS was longest on weekdays. After correcting for age, sex and trauma, the mean LOS was 13.1 minutes shorter in the evening (95%CI: 8.2–18.1 min, $P = 0.000$), 20.4 minutes shorter at night (95%CI: 13.9-27.0 min, $P = 0.000$) and 11.0 minutes

shorter on weekend days (95%CI: 4.7-17.2 min, $P = 0.001$). Compared to self-referred patients, only the LOS for patients referred by medical professionals remained significantly longer, with 32.9 minutes (95%CI: 27.7-38.2 min, $P = 0.00$). For follow-up, LOS was longest for patients requiring a hospital admission. LOS remained significantly shorter with 41.2 minutes for patients followed up at outpatient clinics (95%CI: 35.4-46.2 min, $P = 0.000$), 49.9 minutes shorter for patients followed up with their GP (95%CI: 40.3-57.1 min, $P = 0.000$) and 44.6 minutes shorter for patients who did not need any follow-up (95%CI: 43.2-55.1min, $P = 0.000$) (Table 5). There was no significant difference in LOS between ECAP and non-ECAP hospitals after-hours.

DISCUSSION

This study assessed ED patient characteristics and care pathways in the Netherlands, exploring differences in EDs with and without an ECAP and their links with LOS. Compared to non-ECAP EDs, patients attending ECAP EDs are older, have a higher referral rate and a higher admission rate. There was no significant difference in LOS between the two settings. The overall median LOS was 130 minutes. Factors associated with a longer LOS were older age, presentation during weekdays, referral by medical professionals and hospital admission. A factor associated with a shorter LOS was linked to patients who underwent ancillary tests prior to ED presentation.

Although it is difficult to compare patient characteristics between different healthcare systems, we found that the average Dutch ED patient is older compared to the UK, where as high as 43% is under 30 years old.⁹

This study showed an overall admission rate of 36.3% of all ED attendances, which is higher in percentage compared to the US and the UK.¹⁰ With only 11.4% of the already small group of self-referrals (21.2%) being admitted compared to 48.9% of patients being referred by their GP, suggests that GPs function well as gatekeepers to the ED.

We found a median LOS of 130 minutes, which is relatively short, compared to internationally published estimates of LOS, which had median values from 176 minutes to 480 minutes.¹¹ Our data showed a shorter median LOS for both admitted patients and discharged patients compared to the United States for similar sized EDs, hospitals with the same number of in-hospital beds and EDs with more than 20% trauma related problems.¹² Factors related to a longer LOS probably represent similar patients, for instance patients being admitted to the hospital are often older and referred by a medical professional. This group may benefit from organisational improvements at the ED such as fast tracks.¹³ To guarantee patient safety in such fast tracks more insight into risk factors is needed, which indicate a need for more extensive diagnostic procedures (i.e. abdominal pain in an elderly patient).

Our study showed a significant shorter LOS for patients referred via the radiology department compared to other origins. In the Netherlands, it is a common procedure during office hours and at several ECAPs to refer the patient directly to the radiology department for ancillary testing. If an abnormality is found, the patient will then be referred to the ED. When no abnormalities are found, the patient will not present at the ED but will be referred back to the GP.³ Implementing this possibility for all GPs and ECAPs could further reduce the overall median LOS for ED attendances that require an ED visit, since tests have already been performed. Furthermore, it will decrease the number of unnecessary referred patients, should a test be negative. If GPs also have the possibility to perform diagnostic laboratory tests after-hours as they do during office hours, this would further reduce the number of referred patients.

There are several factors identified as causes for crowding and all of them could explain the relatively short LOS in Dutch EDs. One of the factors is the non-urgent ED patient. In the Netherlands approximately 1.9-2.2 million patients visit the ED yearly, around 124-135 visits per 1000 inhabitants.¹⁴ This is low compared to other countries like the United States, 405-428 per 1000 inhabitants, Canada, 470 per 1000 inhabitants and the UK where 396 per 1000 inhabitants visit the ED yearly.¹⁵⁻¹⁸ Good access to quality primary care is the key reason for the large difference in ED visits.¹⁹

In the Netherlands, primary healthcare is well-developed and accessible for patients 24 hours a day. During office-hours patients can see their own GP, usually on the same day. After-hours, GPs provide emergency services through large-scale GP cooperatives.¹ In the United States, where the median LOS is longer compared to the Netherlands, access to primary care is not readily available for everyone. In fact, the number of GPs providing after-hours care is only 29% compared to almost a 100% in the Netherlands. As a result, United States EDs may increasingly serve as a safety net with increasing numbers of patient visits.²⁰ The average annual number of 26,666 patient visits per ED in the United States (total of annual ED visits divided by total number of national EDs) is high compared to the Netherlands, where an average of 22,448 patients visit each ED per year.²¹

Another factor associated with crowding is the number of hospital beds. The Netherlands has 4.7 beds per 1000 inhabitants, compared to 3.0 beds per 1000 inhabitants in the United States and the United Kingdom, and 3.2 beds per 1000 inhabitants in Canada.²² It seems that the overall healthcare system in the Netherlands plays a large role in the shorter LOS.

We did not find a significant difference in LOS after-hours between hospitals with and without an ECAP, even though hospitals with an ECAP see more referred patients and more patients requiring an admission, both factors associated with a longer LOS.³ When analysing 1000 consecutive patients in non-ECAP EDs with a higher percentage of self-referrals, and comparing them with 1000 consecutive patients in ECAP EDs, which are mostly, referred patients, a similar

LOS might assume that the acuity of patient does not differ between the two groups or that referred patients are more likely to be admitted. This could imply that it is not the illness severity of the patient that is predictive for the LOS, but rather the ED procedure. Unfortunately, the three different triage systems did not make it possible to compare acuity between patients. Since diagnostic tests however are ordered for 65% of the non-urgent patients and 95% of the urgent patients in Dutch EDs, the similar LOS we found at both ECAP and non ECAP EDs is likely caused because there is no difference in performed diagnostic tests between the self-referral and the referred patient.²³ Although ED managers mentioned crowding as a problem in a web-based survey, factors associated with LOS in EDs in the Netherlands were never studied.²⁴

Though the data was extracted from digital hospital systems, they included self-reported data, which could have caused inaccuracies. Furthermore this study did not involve academic centers. The data does however represent the overall Dutch healthcare system with EDs from seven different regions and EDs with an ECAP comparable in size and urbanisation to EDs without an ECAP. When combining patients referred by GPs and patients arriving by ambulance in the same group, there inevitably is a small percentage of self-referrals in that group. Ambulances, however, have the option not to transport the patient to the ED and instead have patients use their own mode of transport or contact the patients GP and hand over treatment. This makes the percentage of low-acuity patients in the combined group small and therefore it seems plausible to combine them. To the best of our knowledge, this is the first research in Dutch EDs exploring differences on care pathways between ECAP EDs and non-ECAP EDs and their association with LOS.

This study showed that ECAPs have an influence on ED characteristics and care pathways with older age, more referrals and higher admission rates at ECAP EDs, all factors associated with a longer LOS in this study. With 130 minutes, the median LOS in Dutch EDs is relatively short. LOS was longer for older patients, patients referred by medical professionals and patients who required a hospital admission. With the number of ECAPs increasing, LOS can perhaps decrease, by strengthening primary healthcare even more, through increasing GP access to ancillary services like radiology and laboratory tests and by collaboration guidelines of GP and ED care. Gaining insight into presenting complaints and performed diagnostic tests seems crucial to develop these guidelines and implement fast tracks to reduce LOS.

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Chapter 7

Complaints and diagnoses of emergency department patients in the Netherlands: a comparative study of integrated primary and emergency care

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ABSTRACT

Objective

In the Netherlands, increasing numbers of emergency departments (EDs) and general practitioner cooperatives collaborate by creating one emergency-care-access-point (ECAP). This has resulted in fewer patients at ECAP EDs. The objective of this study was to explore differences in patient characteristics, presented complaints and ED discharge diagnoses between EDs with an ECAP and EDs without an ECAP.

Methods

A retrospective observational study was performed with 1800 consecutive patient records sampled from six EDs spread over the Netherlands in 2013. We extracted data on time and date of presentation, sex, age, presenting complaint, discharge diagnosis, origin and follow up.

Results

At ECAP EDs, mean age was 47.8 years (95%CI 46.1-49.4) compared to 41.3 (95%CI 39.7-42.9). Compared to non-ECAP EDs, more patients were referred by medical professionals (74.7% versus 46.8%), more patients received hospital admission (45.2% versus 29.0%) and fewer patients received GP follow-up (4.1% versus 16.9%). There was no significant difference in presenting complaints between ECAP and non-ECAP EDs. Most prevalent complaints were trauma (25.7% versus 29.7%), abdominal pain (12.1% versus 10.9%) and general symptoms (7.8% versus 4.8%). The most prevalent ED diagnoses significantly differed with fractures and dislocations (10.8%), sprains and strains (10.4%) and respiratory infections (6.8%) at ECAP EDs versus fractures and dislocations (10.7%), wounds (9.3%) and sprains and strains (8.9%) at non-ECAP EDs.

Conclusion

This study showed that not the presenting complaint, but patient characteristics and referral status differed between ECAP EDs and non-ECAP EDs, suggesting that patients at ECAP EDs had a higher risk of serious disease.

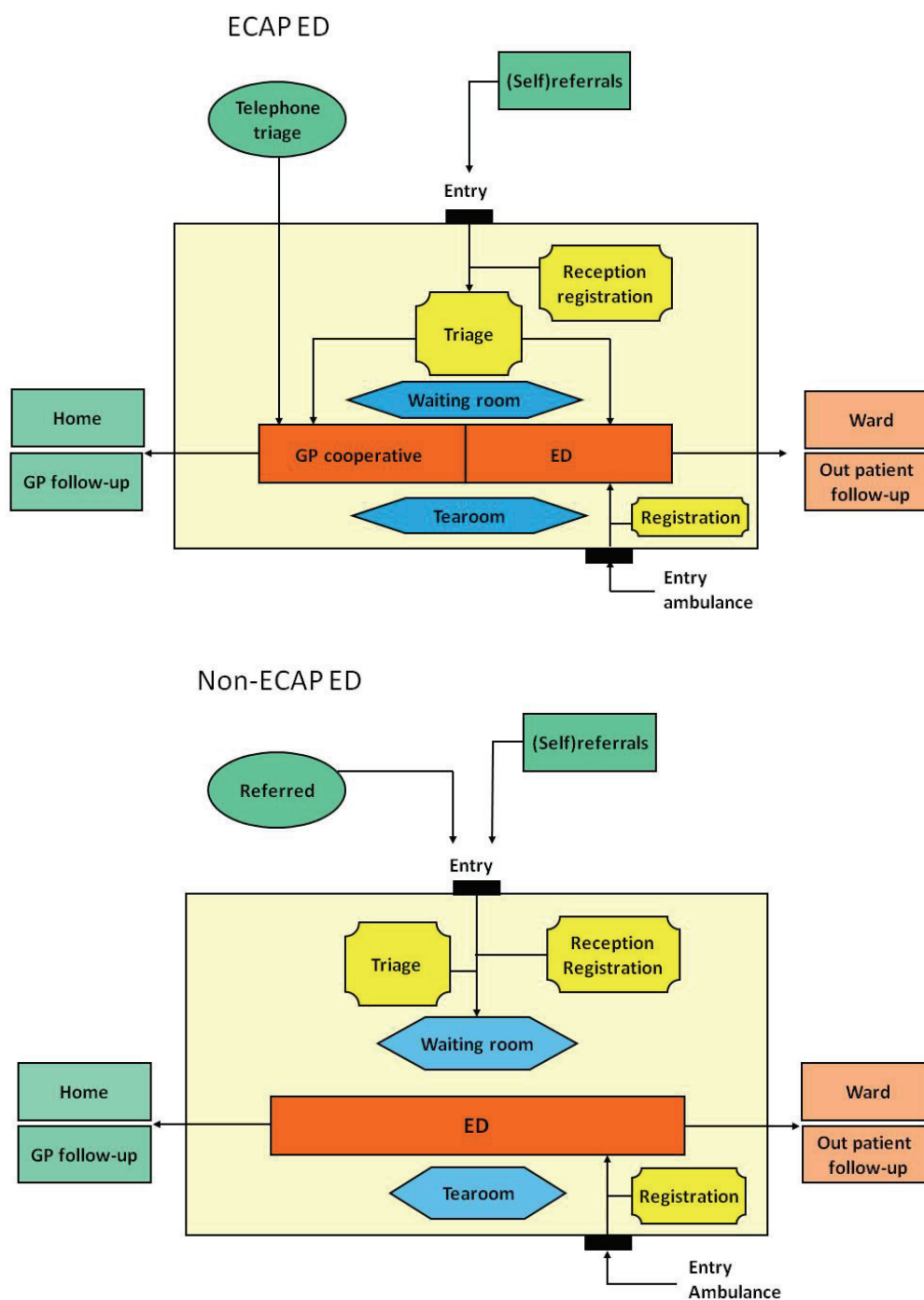
INTRODUCTION

Background

Rising healthcare costs and crowding of emergency departments have worldwide led to initiatives to redirect the self-referred patient to the general practitioner (GP).¹⁻⁵ Readily available access to the GP, especially after-hours is a precondition for this. In contrast to the 29-40.2% of GPs providing after-hours care in the United States, after-hours care is provided by nearly all GPs in several countries, including the Netherlands, New Zealand and the UK.^{6,7} In the Netherlands, after-hours care is provided by more than 130 general practitioner cooperatives (GPC) serving more than 90% of the Dutch population.⁸ A GPC is open from 5 pm to 8 am daily, the entire weekend and on public holidays. Patients can phone a single, regional telephone number where assistants perform triage and either book a consultation at the GPC, send a GP on a home visit or give a self-care advice.⁹ All phone calls are authorised by a GP. The GPC handles the majority of after-hours patient contacts (88%) and refers around 5-7% to the ED.^{10,11} Despite the implementation of a GPC, patients can still bypass the GP and visit the ED at their own initiative. To redirect these self-referred patients to the GP, an increasing number of emergency departments and GPCs collaborate by creating one Emergency Care Access Point (ECAP). A common triage system is then used to decide whether the patient is seen at the GPC or at the ED. (figure 1)

A long-term pre-post follow-up study found that the introduction of an ECAP led to a 27% decrease of ED patients after-hours and a 30% increase in GPC contacts. This was mostly due to a shift of the non-urgent self-referral and changed both admission rates and acuity of patients presenting at an ECAP emergency department.¹² Several single center pilot studies, with short follow-up periods, also found a shift of low acuity patients, mostly self-referrals, from the ED to the GPC, varying from 15% to 53%. After implementation of an ECAP, the patient at an ECAP ED is older and more referred compared to the pre-ECAP situation.^{3,4,13-18} This change in patient flows, however, does not explain the absolute increase in hospital admissions at ECAP EDs. Despite previous research, it is currently unknown why the presence of an ECAP leads to an increased admission rate in the ED. Potential reasons for this increase include an increase in adherence with more GP referrals, unwillingly creating an induced demand system or a lower threshold for admission of referred patients than for self-referred patients for similar complaints. We wondered whether a GPC at an ECAP, refers patients with specific complaints to the ED more often than GPs that do not have an ECAP or that a GPC refers the sicker patients of every category of patients to the ED. In the latter situation, the type of complaints seen in the ED is equal, yet they are more likely to represent a sicker patient group or patients with a higher risk-stratification.

Figure 1. ECAP and non-ECAP setting

**Importance**

Pre-post studies showed that ECAP EDs see older mostly referred patients with higher absolute admission rates after implementing an ECAP.^{3,4,13–18} One factor associated with an increase in hospital admissions could be differences in presented complaints and ED discharge diagnosis

between EDs with and EDs without an ECAP. This has never been studied comparing multiple ECAP EDs and non-ECAP EDs.

Aim

This study aimed to provide insight into the clinical characteristics of patients presenting at ECAP EDs compared to non-ECAP EDs. It will particularly focus on the presented complaints and ED discharge diagnoses, where we expect differences between the two types of organisations.

METHODS

Design and study population

We performed a retrospective observational study of patients sampled from ED records of six emergency departments spread over the Netherlands, varying from urban EDs to large innercity EDs. We selected three EDs that were integrated with GP cooperatives forming one Emergency Care Access Point (ECAP) and three comparable EDs in size and location (urban or innercity) that were not integrated. At an ECAP, patients have one access point and triage decides whether the patient is seen by a GP or in the ED. At EDs without an ECAP, patients can bypass the GP and present directly to the ED. We collected a total of 1800 patient records, 300 patients attending each ED after triage, starting 1 February 2013. To make sure we only included patients during ECAP opening hours (out-of hours), we collected the first consecutive 100 patient visits during the evening, the first 100 at night and the first 100 during weekend days, a total of 300 patients of each hospital. This could comprise several days. The medical ethical committee granted institutional review board exemption.

Measures

Using a standardised registration form we collected time and date of presentation, sex, age, acuity, presented complaint, discharge diagnosis, origin (self-referred, referred by medical professionals) and follow-up (admission, follow-up at the out-patient clinic or GP, no follow-up). Patients who were registered in the system, but did not receive healthcare in the ED were excluded. For instance we did not include a patient who after registration, was seen directly in the obstetric ward. Some patients referred by the GP could arrive by ambulance. Depending on the hospital registration system, these patients were either coded as "referred by GP" or "arrived by ambulance". We combined the two options in one category: "referred by medical professionals". This category also included private 112 calls for an ambulance, which theoretically are self-referred patients. Ambulance paramedics in the Netherlands, however, are not obligated to transfer every 112-calling patient to the ED, instead they can contact the patients GP for a consult or request the patient to use other means of transportation. We therefore believe that the percentage of "unnecessary" self-referrals that should not have been transported to the ED by ambulance is small in the "referred by medical professionals" group. We first coded the presented complaint according to the International Classification of Primary Care 2nd edition of

the Wonca International Classification Committee (ICPC-2-NL) and the single best discharge diagnosis using the ICD-10 version 2006 of the Dutch WHO-FIC Collaborating Centre. We then grouped similar ICPC codes and ICD 10 codes for analysis purposes and named them post-hoc groups. For instance, in the ICPC codes we grouped abdominal pain, which contains D01 (Generalised abdominal pain), D02 (Stomach pain) and D06 (Other localised abdominal pain). For the ICD 10 codes, for example, we combined all fractures due to a trauma (S62.6, S52.5, S62.3 etc.) in one group. We collected descriptive data specific to each hospital and ED, which could have an effect on patient characteristics, like tertiary referral cardiac hospital or dialysis, triage system and annual patient ED visits in 2012 (Table 1). Since hospitals do not routinely code in ICPC or ICD-10, two researchers (author 1 and 2) independently coded all presented complaints on the basis of recorded information. When there was a difference in coding, mutual agreement was reached through following a pre-set protocol. This led to consensus in all cases. ICD-10 coding was based on the diagnosis on the discharge notes in the ED or when admitted and available, on the discharge letter from the admitting specialty. When no final diagnosis was recorded the presenting complaint was coded as an ICD-10 code.

Outcomes

The primary outcomes of interest in this study were patients' presented complaint and ED discharge diagnosis. Secondary outcomes were patients' origin (self-referred, referred by medical professionals) and follow-up (admission, follow-up at the out-patient clinic or GP, no follow-up).

Analysis

Integrity was checked for all data and entered in a research database. We used IBM SPSS version 19 for statistical analysis. To compare differences between ECAP EDs and non-ECAP EDs, descriptive statistics were used. We analysed for differences with a T-test or chi-square test where appropriate. We considered $P < 0.05$ statistically significant. We explored whether patients' presented complaint and discharged diagnosis was related to the presence of an ECAP. We grouped similar complaints and diagnosis post-hoc to reach at least a minimum of 80% of cells expected count more than five.

RESULTS

Table 1 describes the characteristics of the participating hospitals and EDs which were evenly spread over the country, comparable in size and included the two largest national EDs, one with an ECAP and one without an ECAP. In the ECAP group, two hospitals had an emergency cardiac care unit, one hospital was a tertiary cardiac referral center performing primary cardiac interventions and one hospital was a dialysis center. This was the same in the non-ECAP group. GPCs at two ECAPs could order X-rays during evening hours without referring the patient to the ED, one could not. This was not possible at night for all of them. One non-ECAP ED was also a trauma-center. In 2012, a total of 213.792 patients attended the researched EDs of which 62.389

patients were admitted to hospital. This represents an admission rate of 29.2% of all ED attendances and 34.8% of all hospital admissions. All hospital EDs were open 24/7, 3 of which had emergency consultants on at night (Table 1).

Table 1. Overview of hospital and ED characteristics divided in ECAP and non-ECAP hospitals over 2012

		Overview Hospitals		
		ECAP hospitals	Non-ECAP hospitals	Total
Hospital	Urbanisation	2 Urban, 1 Innercity	2 Urban, 1 Innercity	--
	Total hospital beds ^b	654 - 696	545 - 955 ^c	545-955 ^c
	Total admissions ^b	99.412	79.763	179.175
	ED admissions of total hospital admissions (%) ^b	32.7	37.5	34.8
ED	Mean length hospital stay (days) ^b	4.3 - 4.8 ^a	5.0 - 5.4 ^a	4.3 - 5.4
	Total patients per year ^b	99.859	113.933	213.792
	Total ED admissions ^b	32.506	29.883	62.389
	ED admissions of total ED presentations (%) ^b	32.6	26.2	29.2
	EP resented 24/7 ^d	1 Yes, 2 No	2 Yes, 1 no	--
	Triage System ^e	2 MTS, 1 NTS	1 MTS, 2 ESI	--

^a N/A in year report, calculated (Known admissions and length of hospital stay), ^b table presenting numbers of the year 2012 both office and ECAP hours, ^c also includes daycare beds, ^d when EPs are not present 24/7 they are not there during night hours. ^e MTS=Manchester Triage System, NTS=Netherlands Triage Standard, ESI=Emergency Severity Index.

Table 2 shows that of the total of 1800 included patients, 54.7% was male and 30.8% presented with a trauma related problem. The mean age was 45 years old (median 44.0) with the majority of patients aged between 31 and 50 years old. Of all ED attendances, 29.9% were self-referred, medical professionals referred 60.7% and 3.4% were referred by the radiology department. A total of 37.1% required a hospital admission, 25.9% were followed up at the out-patient clinic, 10.5% were followed up by their own GP during office hours and 22.2% did not require any follow up.

ECAP versus non-ECAP

Table 2 also presents the descriptive patient data of ECAP and non-ECAP EDs. At ECAP EDs the average patient age was 47.8 years (median 50.0) compared to 41.3 years (median 39.0) for non-ECAP EDs. ECAP EDs treated 15.9% self-referred patients who presented at the ECAP and, after triage, were seen at the ED. Non-ECAP EDs treated 44.0% self-referred patients who were seen at the ED directly. At ECAP EDs, more patients were referred by medical professionals (74.7% versus 46.8%) and more patients referred by the radiology department (5.3% versus 1.2%). At ECAP EDs, more patients received a hospital admission (45.2% versus 29.0%) or a follow-up at an out-patient clinic (26.8% versus 25.1%) and fewer patients received a GP follow-up (4.1% versus 16.9%) or no follow-up (19.7% versus 24.7%).

Table 2. Patient characteristics and care pathways (n=1800)

	ECAP EDs N=900	Non-ECAP EDs N=900	Total N=1800
Male (%)	54.0	55.4	54.7
Trauma (%) n=1793 ^b	28.8	33.3	30.8
Age (%)	Median (years)	39.0	44.0
	0-5	7.4	7.3
	6-18	11.8	9.8
	19-30	21.1	18.4
	31-50	22.9	21.6
	51 – 65	16.4	17.7
	66 – 85	16.3	20.8
	> 85	4.0	4.4
Origin (%) ^a	Self-referrals	44.0	29.9
	Referred by medical professionals ^c	46.8	60.7
	Referred by the radiology department	1.2	3.4
Acuity (%) ^d	Immediately (red)	0.4	1.7
	Very urgent (orange)	18.2	17.2
	Urgent (yellow)	41.4	43.1
	Standard (green)	30.3	31.3
	Not urgent (blue)	8.4	4.9
	Missing data	1.1	1.9
Follow-up (%) ^a	Hospital Admission	29.0	37.1
	Out Patient Clinic	25.1	25.9
	GP Follow-up	16.9	10.5
	No Follow-up	24.7	22.2

^a Does not add up to 100% due to other options not shown in the table, ^b 7 missing data, ^c Includes ambulance and patients referred by their GP. ^d 5 categories within the three triage systems used, are added up.

Presented complaint

Table 3 shows the percentage of presented complaints in each ICPC domain comparing ECAP and non-ECAP EDs.

Table 3. ICPC codes for most presented complaint within each domain

ECAP EDs	N	%	Non-ECAP EDs	N	%	P value
1 General, Unspecified (A)	482	53.6	1 General, Unspecified (A)	470	52.2	P=0.07
2 Digestive (D)	139	15.4	2 Digestive (D)	144	16.0	
3 Respiratory (R)	89	9.9	3 Respiratory (R)	75	8.3	
4 Process codes (St)	43	4.8	4 Neurological (N)	39	4.3	
5 Neurological (N)	40	4.4	5 Musculoskeletal (L)	36	4.0	
6 Musculoskeletal (L)	28	3.1	6 Process codes (St)	30	3.3	
7 Cardiovascular (K)	22	2.4	7 Skin (S)	29	3.2	
8 Urological (U)	16	1.8	8 Psychological (P)	22	2.4	
9 Psychological (P)	13	1.4	9 Urological (U)	17	1.9	
10 Skin (S)	13	1.4	10 Cardiovascular (K)	14	1.6	
900 ^a			900 ^a			

Process codes (St) are *63 (return visit check-up) *62 (No letter available), *69 (problems with iv line or drain or healthcare workers needle stick injuries etc.)

^a Does not add up to a total of 900 due to other options not shown in the table.

The three most prevalent categories in the ICPC domains were equally represented, namely category A, General and Unspecified (53.6% versus 52.2%) D, Digestive (15.4% versus 16.0%) and R, Respiratory (9.9% versus 8.3%). Within these three ICPC domains the most presented complaints are similar for ECAP and non-ECAP EDs, namely Trauma (47.9% versus 56.8%), Localised abdominal pain (38.8% versus 32.6%) and Shortness of breath (58.4% versus 57.3%) (Table 4).

Table 4. Most frequent presented ICPC domains

ECAP EDs N=900			
ICPC domain % of total	Most frequent presenting complaint within ICPC domain	N	% Within ICPC domain
A General, Unspecified N=482 53.6%	Trauma (A80)	231	47.9
	General symptoms (A29)	69	14.3
	Chest pain (A11)	54	11.2
D Digestive N=139 15.4%	Localised abdominal pain (D06)	54	38.8
	Generalised abdominal pain (D01)	44	31.6
	Stomach ache (D02)	11	7.9
R Respiratory N=89 9.9%	Shortness of breath (R02)	52	58.4
	Coughing (R05)	22	24.7
	Epistaxis (R06)	9	10.1
Non-ECAP EDs N=900			
ICPC domain % of total	Most frequent presenting complaint within ICPC domain	N	% Within ICPC domain
A General, Unspecified N=470 52.2%	Trauma (A80)	267	56.8
	General symptoms (A29)	43	9.1
	Worried of treatment (A13)	39	8.3
D Digestive N=144 16.0%	Localised abdominal pain (D06)	47	32.6
	Generalised abdominal pain (D01)	42	29.2
	Vomiting (D10)	14	9.7
R Respiratory N=75 8.3%	Shortness of breath (R02)	43	57.3
	Coughing (R05)	16	21.3
	Epistaxis (R06)	4	5.3

After post-hoc grouping of the complaints into categories, the three categories with highest prevalence remained the same for ECAP and non ECAP EDs, namely, trauma (25.7% versus 29.7%), abdominal pain (12.1% versus 10.9%) and general symptoms (7.8% versus 4.8%). Overall, we found no significant differences in presented complaints between ECAP EDs and non-ECAP EDs.

ED Discharge diagnosis

Table 5 shows that, when comparing discharge diagnosis between ECAP EDs and non-ECAP EDs, within the ICD 10 domains, the three most prevalent domains were equally represented: "Injury, poisoning and certain consequences of external causes" (30.8% versus 35.4%), "Symptoms, signs

and abnormal clinical and laboratory findings, not elsewhere classified" (19.2% versus 19.2%) and "Diseases of the respiratory system" (10.9% versus 9.6%).

Table 5. ICD 10 Discharge diagnosis codes in each domain^a

ECAP EDs		N	%	Non-ECAP EDs		N	%	P value
XIX	Injury, poisoning	277	30.8	XIX	Injury, poisoning	319	35.4	<i>P=0.032</i>
XVIII	Symptoms, signs	173	19.2	XVIII	Symptoms, signs	173	19.2	
X	Respiratory	98	10.9	X	Respiratory	86	9.6	
IX	Circulatory	66	7.3	XX	External causes	54	6.0	
XI	Digestive system	59	6.6	XI	Digestive system	48	5.3	
I	Infectious	37	4.1	XXI	Factors influencing health	42	4.7	
XX	External causes	37	4.1	IX	Circulatory	39	4.3	
XXI	Factors influencing health	33	3.7	I	Infectious	32	3.6	
XIV	Genitourinary	31	3.4	XIV	Genitourinary	24	2.7	
VI	Nervous system	19	2.1	VI	Nervous system	18	2.0	
Total		900 ^b				900 ^b		

^a free text of the codes is shortened for table purposes. ^b Does not add up to a total of 900 due to other options not shown in the table.

After post-hoc grouping the specific discharge diagnosis into categories, the three categories with highest prevalence were Fractures and dislocations (10.8%), Sprains and strains (10.4%) and Respiratory infections (6.8%) for ECAP EDs compared to Fractures and dislocations (10.7%), Wounds (9.3%) and Sprains and strains (8.9%) for non ECAP EDs (Table 6).

Table 6. Top ten of grouped ICD 10 codes^a

ECAP EDs		N	%	Non-ECAP EDs		N	%	P value
Fractures and dislocations		97	10.8	Fractures and dislocations		96	10.7	<i>P=0.001</i>
Sprains and Strains		94	10.4	Wounds		84	9.3	
Respiratory infections		61	6.8	Sprains and Strains		80	8.9	
Abdominal pain, unspecified		50	5.6	Abdominal pain, unspecified		56	6.2	
Specific abdominal diagnosis		44	4.9	Respiratory infections		55	6.1	
Neurological diseases		40	4.4	Other ^c		50	5.6	
Other ^c		40	4.4	Neurological diseases		35	3.9	
Chest pain, unspecified		39	4.3	Intoxications		33	3.7	
Urogenital diseases		34	3.8	Urogenital diseases		32	3.6	
Intoxications		32	3.6	Specific abdominal diagnosis		31	3.4	
		900 ^b				900 ^b		

^a free text of the codes is shortened for table purposes. ^b Does not add up to total 900, due to categories not shown in this table, ^c contains diagnoses not fitting in any other group and too small for a single group, (for example Glaucoma, allergic reaction).

For both ECAP and non-ECAP patients, in 15.0% and 14.4% respectively no diagnosis was made. Of this group the most recorded discharge diagnosis was Unspecified abdominal pain (5.6% versus 6.2%), Unspecified chest pain (4.3% versus 2.9%) and Syncope (1.1% versus 1.8%).

DISCUSSION

This study explored the influence of the presence of an ECAP on ED patient characteristics, complaints and discharge diagnoses. Compared to non-ECAP EDs, patients at ECAP EDs were older, more patients were referred by medical professionals and more patients received a hospital admission. We found some small differences in discharge diagnoses between ECAP EDs compared to non-ECAP EDs, but no difference in presented complaints.

Our study found a higher percentage of patients, referred to the ED at an ECAP ED (74,7%) compared to a non-ECAP ED (46,8%). This finding is similar to previous Dutch studies with pre-post ECAP settings, showing a shift of patients from secondary to primary care, resulting in a decrease of the number of ED patients and an increase of the number of GPC patients.^{4,8,12} Although, we used multiple ECAP EDs and non-ECAP EDs spread over the country, instead of a pre-post setting, the differences we found in patient characteristics and flows, especially a higher hospital admission at ECAP EDs compared to non-ECAP EDs are consistent with previous studies.^{3,4,13-18} We found no differences between ECAP EDs and non-ECAP EDs for presented complaints. Our study showed that trauma was the most prevalent reason for consulting the ED. After trauma, in both ECAP and non-ECAP EDs the most presented complaints were abdominal pain and respiratory problems. These findings are supported by previous studies in Europe, although some studies found chest pain as most presented complaint.^{14,20-23} In our research setting, most patients with chest pain, especially the referred patients are likely to have been seen directly at the emergency cardiac care unit, bypassing the ED and therefore comprise a small percentage of all patients, especially within the referred group. In Asia patients, the most prevalent complaint is respiratory problems, mostly asthma related.²³ In the United States, ED patients mostly present with stomach and abdominal pain, fever, cough, headache and back symptoms.^{24,25} The latter four are complaints, patients in the Netherlands mostly present with at the GP.²⁶ The difference in ED patient characteristics with similar complaints, suggests that co-factors, like higher age and referral, are more predictive of admission then the actual complaint. Older and referred patients have a higher a-priori chance of a more serious disease and a higher likelihood of staying within the hospital setting after being referred.^{19,27} Furthermore, single center studies show that the non-urgent referred patient has a higher admission rate and more diagnostic tests performed compared to the self-referring non-urgent patient.^{12,19}

Our study found that the difference in patient discharge diagnoses is mostly caused by wounds, intoxications and specific abdominal diagnosis, where we found fewer patients with wounds and intoxications and more patients with specific abdominal diagnosis at ECAP EDs. The GPC deals with the majority of all after-hours patient contacts (88%) and refers around 5-7% to the ED.^{9,10,26} The presentation of patients at an ECAP ED with similar complaints compared to non-ECAP EDs, yet a higher percentage of admissions and difference in discharge diagnoses, suggests an appropriate referral to the ED. For the ED, however it is not clear if all admitted patients require a

hospital admission on the basis of their clinical presentation, as a referral alone has a higher likelihood of an admission.^{19,27}

There is a growing tendency in recent years to intensify collaboration between primary care and hospital based emergency care. The ECAP EDs in the Netherlands represent the closest form of collaboration between primary care physicians and hospital emergency physicians. The main reason for implementing ECAPs is the reduction of healthcare costs by redirecting the non-urgent self-referred patient to the GP. With a resulted decrease in overall ED utilisation, this seems a success. However, since the number of referred patients increased and they have more diagnostic tests performed and are more likely to be admitted, this questions the actual reduction in healthcare costs. More insight is needed into the reasons for general practitioners to refer a patient to the ED (sicker patient, no GP possibility for ancillary testing, ED is just next door and thus convenient) and for ED physicians to admit a patient (medically needed, referred by the GP). This will optimise the ECAP setting, reduce healthcare costs and maintain quality of care.

In summary this study showed that ED patients in the Netherlands, overall present with similar complaints but at ECAP EDs, they seem more seriously ill or at risk, given their higher age, referral status and admission rates. Although we could not look at acuity, our results suggest that the implementation of an ECAP is an important factor, influencing emergency hospital care.

Limitations

Patient records do not routinely register ICPC and ICD-10 codes. This was done purposefully for this study by two trained clinicians. Since this was a retrospective analysis, coding was based on available information, which could have led to wrongful coding in some cases. This also counts for grouping the codes. Published studies did not clearly describe how this grouping was done; it is therefore difficult to compare outcomes. For analysis purposes, we grouped similar complaints and diagnosis post-hoc to reach at least a minimum of 80% of cells expected count more than five. This unfortunately, enlarges patient complaint and diagnoses group and will lead to a loss of specific diagnoses. We found no large differences in acuity between ECAP and non-ECAP EDs, unfortunately, we could not statistically compare groups as different triage systems were used.

This study was done in the Netherlands, a country with a well-developed primary care system. Conclusions of this study might therefore not be applicable to countries where primary care is less well accessible or less comprehensive regarding ambulatory care-sensitive conditions (e.g. diabetes and COPD).

This study looked at the first complaint and diagnosis registered on the discharge note. There is a bias from the treating physician who decided what to write on the progress notes first.

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Chapter 8

General discussion

The aim of this thesis was to provide insight into the characteristics of emergency departments (EDs) in the Netherlands, with a special focus on the influence of an emergency-care-access-point (ECAP). At an ECAP, emergency departments and GP cooperatives (GPCs) have created one point of entry where triage outcome decides if the patient is seen at the GPC or at the ED. This final chapter starts with a brief summary and interpretation of the main findings of the studies. Then it discusses methodological considerations and implications for daily practice and future research.

Characteristics of Emergency Departments

Main findings

- The organisation of emergency care is evolving quickly in the Netherlands. GP cooperatives and emergency physicians (EPs) play an important role in these changes. Emergency departments in the Netherlands are at different stages of development. An overall trend is that the presence of emergency physicians is increasing and more EDs will be staffed with EPs.
- EDs in the Netherlands see a third of patients (124-135) per 1000 inhabitants compared to the United States (405-428), Canada (470) and the United Kingdom (396). In recent years the number of EDs decreased and patient numbers slightly decreased after an initial increase at the beginning of the century.
- EPs are significantly more present in larger EDs, in EDs where there is more continuing professional education and where there are more clinical audit activities. The presence of emergency physicians is positively associated with quality of emergency care.
- The median length of stay (LOS) in Dutch EDs is 130 minutes. Factors associated with a longer LOS are older age, presentation during office-hours, referral by medical professionals and hospital admissions. A factor associated with a shorter LOS is linked to patients who underwent diagnostic radiology tests prior to ED presentation.
- In the ED, diagnostic tests are ordered for 65% of the non-urgent patients and 95% of the urgent patients. The majority of ED patients (66.8% non-urgent and 74.1% urgent) has a subsequent follow-up at the outpatient clinic. At the GP cooperative 6% of the non-urgent and 14% of the urgent patients receive a diagnostic test. Almost two thirds of contacts are completed at the GPC, mostly without ordering additional diagnostic tests; the other third has a follow-up contact, usually with primary care.
- Referred non-urgent patients are more often admitted (27% versus 3%) to the hospital or followed up at an out-patient clinic (84.2% versus 48.2%) compared to self-referred non-urgent patients.

- The median age of ED patients is 44 years. The majority is male and about a third presents with a trauma related problem. Of all ED patients, around 30% is self-referred and 37% requires a hospital admission. This is 38% of all hospital admissions, acute and elective.

Influence of an emergency-care-access-point (ECAP) on emergency departments

Main findings

- The introduction of an ECAP is associated with substantial changes in the flow of patients, including an overall decrease in ED utilisation, a decrease of self-referring ED patients and a higher probability of hospital admission and clinical follow-up for patients attending an ECAP ED.
- Patients at ECAP EDs are older compared to non-ECAP EDs (50 versus 39 years), more patients are referred by medical professionals (74,7% versus 46.8%) and more patients are admitted (45.2% versus 29.0%). It is not the presenting complaint, but more so, the older patient and a referral by professionals that seems a proxy for a hospital admission. This makes the ECAP an important factor, influencing emergency hospital care.
- The difference in patient characteristics and discharge diagnosis between ECAP EDs and non-ECAP EDs does not lead to a difference in ED length of stay.
- Most presented ED complaints are trauma, localised abdominal pain and shortness of breath. There is no significant difference between ECAP EDs and non-ECAP EDs.
- The three most prevalent patient diagnoses for ECAP EDs, are fractures and dislocations (10.8%), sprains and strains (10.4%) and respiratory infections (6.8%) compared to fractures and dislocations (10.7%), wounds (9.3%) and sprains and strains (8.9%) for non ECAP EDs.

Interpretation of findings

Emergency Care

Emergency medical care in the Netherlands is mainly provided by emergency departments, general practitioners and ambulance services, although coordination between these different providers is limited. All providers underwent major changes in the last 15 years. Emergency departments have introduced emergency physicians; general practitioners have changed their after-hours care from small rota groups into large GP-cooperatives and ambulance services changed from multiple private organisations into large regional ones, implementing a national training scheme and national guidelines.¹⁻³ With growing healthcare costs, politicians and stakeholders increasingly show interest in emergency care. The Inspectorate of Healthcare published several reports stating that costs should be reduced and quality of emergency care improved.⁴⁻⁶ The development of GP cooperatives plays a role in the position of EDs. Where they

are integrated, the non-urgent self-referred patient will be redirected to the GP and where they are not, the self-referred patient can bypass the GP cooperative and present to the ED directly.⁷ GP cooperatives, therefore, influence the ED patient population. This makes the ED the receiving end of emergency care, working in close relationship with the GP and the ambulance services.

Emergency Departments

The number of EDs in the Netherlands has steadily decreased in the last decade and this is still an ongoing trend. In 2012, there were 93 EDs operating 24/7 compared to 105 EDs in our research data over 2009, a decrease of 9% in three years. After an initial increase in ED patients (1.9 million in 2004 and 2.2 million in 2009), recent years show a decline in ED patient numbers (2 million in 2012), although overall changes are small.^{8,9} This decline in ED visits coincides with the implementation of ECAPs. We described the status of emergency care in the Netherlands with a focus on emergency departments. This was a challenge given the lack of relevant empirical research. Although it is hard to draw general conclusions, it has become clear that the organisation of emergency medicine is evolving quickly. Both emergency physicians and GP cooperatives play an important role in these changes.

Staff and training

Since the publication of our review (2011) more ECAPs have emerged in the Netherlands and more EDs are staffed with EPs. Where we reported 58.5% of EDs staffed with at least one EP in our web-based survey conducted in 2010, this increased to 80% in 2013.¹⁰ We found that EPs work in small and large hospitals as well as in academic settings in all regions of the Netherlands. EPs work significantly more often in larger EDs with more patient visits per year. This is explained by the fact that EPs initially started working in larger EDs with emergency medicine (EM) training programs and over time expanded to academic hospitals and rural areas. Our study suggests that EPs have a positive influence on physicians attending ABCDE courses and in implementing clinical audit activities. Although, it is likely that ED leadership, hospital management and white papers are all of influence as well, it seems plausible that EPs play the main role. This is largely due to the increase in EP numbers and the growing position of the Netherlands Society of Emergency Physicians (NVSHA) within the acute care domain. This organisation supervises 28 national training schemes and quality visitations are planned as of 2014 for all emergency departments, similar to other medical scientific societies. Though this will raise the already improved care in Dutch EDs, further research on emergency care in the Netherlands is needed to support further improvements. Research in emergency care in general and emergency departments in particular has not received much interest of other medical specialties. There is very limited national research available looking at EPs contribution on quality of care. There is however extensive international literature supporting the positive influence of emergency physicians on quality of care.¹¹ With growing numbers of EPs, more studies have been conducted in the Netherlands.

From 2011 to 2014 the numbers of internationally published research articles written by Dutch EPs has steadily increased but output is still low.¹²

Although the number of EPs is growing, not all EDs are staffed with EPs. Given the preferred optimal situation of 24/7 EPs, this will only be a matter of time. Undoubtedly EPs already have improved the quality of patient care on an individual patient level, but until EDs are staffed with sufficient numbers of EPs for 24/7 patient care, it will be difficult to implement overall clinical improvements and develop EM guidelines.¹³ An important factor to achieve this on a long term basis is a good balance between working ED shifts and having clinical support time for management, research, guideline development and improve training schemes.¹⁴ Since emergency medicine is a young specialty, it is wise to look at factors associated with a burnout at an early stage. This will prevent percentages as high as 60% of internationally working EP's, experiencing symptoms of a burnout.¹⁵ Finally, when EDs are 24/7 staffed with EPs working together with 24/7 ED nurses, this will lead to better teamwork and thus improve the quality of care.¹⁶⁻¹⁸

Patients

In the Netherlands approximately 1.9-2.2 million patients visit the ED yearly, around 124-135 visits per 1000 inhabitants.^{8,9} This is low compared to other countries like the United States, 405-428 per 1000 inhabitants, Canada, 470 per 1000 inhabitants and the UK where 396 per 1000 inhabitants visit the ED annually.¹⁹⁻²² Good access to quality primary care is the key reason for the large difference in ED visits.²³ Less than half of adults are able to get a same or next day primary care appointment in the US or Canada and more than 25% of UK adults report that it rarely happens to hear back the same day.²⁴ In contrast to the Netherlands, access to after-hours primary care in the US and Canada is limited and not available for non-insured patients.²⁵ In several of our studies we looked at patient characteristics at emergency departments in the Netherlands. We found large differences across EDs, with annually patient presentations ranging from 7.818 to 48.230. Overall, the majority was male and the mean age between 36 and 47 years old. Of all ED attendances, the mean percentage of self-referrals was between 21.2% and 37.4%, 16-44% required a hospital admission and 25-36% of patients presented with a trauma related problem. This wide range of variation was consistent in all the databases we used. Of the self-referred patients, more than 60% were between 16 and 51 years old, 57.5% were male and only 11.4% were admitted. Of the referred patients, around 50% were between 51 and 86 years old, 49.6% were male and 48.9% were admitted. We found large variations in percentages of self-referred patients between individual hospitals throughout our databases varying between 9.4% and 51.2%; the lowest percentages (mean 15.6%) representing ECAP EDs and the highest percentages (mean 38.7%) representing non-ECAP EDs. The overall average percentage of 34% self-referred patients in our study resembles the 30% that was found in a recent survey in which 96% of the EDs participated.¹⁰ This makes our data representative for the Netherlands. Although

it is difficult to compare patient characteristics between different healthcare systems, we found that only 31% of patients are under 30 years old in the Netherlands. The average age of Dutch ED patients is higher compared to ED patients in the UK, where (as high as) 43% is under 30 years old, but younger compared to Germany where the average reported age is 55 years old.^{22,26} We also found a higher admission rate of around 36% compared to the UK (20.8%) and the US (17.5%).^{22,27} With EDs in the US and the UK seeing more patients with primary care treatable problems, this is to be expected.

Our research showed that after categorising all complaints, trauma was the most prevalent complaint when consulting the ED. After trauma, in both ECAP and non-ECAP EDs the most prevalent complaints were abdominal pain and respiratory problems. Comparing these complaints with other studies is difficult because study designs differ. Examples are studies of EDs, which only included referred patients, or studies that have categorised complaints into four groups. Our findings however, are supported by studies in Europe and Canada, although those studies also have chest pain as most presented complaint.^{7,28-30} In our research setting, most patients with chest pain, especially the referred patients are likely to have been seen directly at the emergency cardiac care unit and therefore form a small percentage of all ED patients. In the United States ED patients mostly present with stomach and abdominal pain, fever, cough, headache and back symptoms.³¹ The latter four are complaints that patients in the Netherlands mostly present with at the GP office.³² We only looked at differences in discharge diagnosis between patients presenting at ECAP EDs compared to non-ECAP EDs. From our unpublished data, we know that after trauma, the overall most prevalent diagnosis for ED patients in the Netherlands are respiratory infections, unspecified abdominal pain and unspecified chest pain. This makes the link between presented complaint and discharge diagnosis weak.³³ Although chief complaints can pre-select patients into certain fast tracks, it is difficult to allocate a patient to a specialist discipline before a diagnostic work-up.²⁶ This emphasises the need for EPs.

Overall, the contact frequency at EDs in the Netherlands is 2-3 times lower compared to other western countries. Furthermore, patients presenting at emergency departments in the Netherlands have different characteristics compared to other countries. They are older, mostly referred, present with different complaints and have a higher likelihood of being admitted. These differences can be attributed to a well-developed and accessible primary care system.

Crowding

Crowding of emergency departments leads to an increased length of stay (LOS) and is a growing concern in many countries. Increased LOS is associated with decreased patient satisfaction, treatment delays, patients leaving without being seen and ambulance diversions. Non-urgent visits, influenza season and hospital bed shortages are some of the factors that have been identified as causes for crowding.³⁴⁻³⁷ Because non-urgent ED visits are also associated with ED

crowding, policies to redirect these patients to primary care might contribute to a reduction of LOS.^{23,38} The success of redirecting patients is influenced by the structure of the national healthcare system and the position of primary healthcare. Worldwide, different models of organised healthcare systems are used to redirect patients to primary care services, each having its unique effect on the ED patient population.^{39,40}

In the Netherlands, primary healthcare is well-developed and accessible for patients 24 hours a day. During office-hours patients can see their own general practitioner, usually on the same day. After-hours, GPs provide emergency services through large scale GP cooperatives.² Although crowding is mentioned as a problem by ED managers in a web-based survey, factors associated with LOS in EDs in the Netherlands were never studied.⁴¹ Our study showed that the majority of patients attended the ED during office-hours with a peak between 12pm and 5pm. We found a median LOS of 130 minutes, which is relatively short, compared to other western countries, where LOS ranges from 176 minutes to 480 minutes.^{35,42,43} Our data showed a shorter median LOS for both admitted patients and discharged patients compared to the United States for similar sized EDs, hospitals with the same number of in-hospital beds and EDs with more than 20% trauma related problems.⁴⁴⁻⁴⁶ There are several factors identified as causes for crowding and all of them could explain the relatively short LOS in Dutch EDs. One of the factors is the non-urgent ED patient. The Netherlands has a good accessibility to GP care, which results in a third of ED visits per 1000 inhabitants compared to other countries.^{10,20-23} In the United States, where the median LOS is longer compared to the Netherlands, access to primary care is not readily available for everyone. In fact, the number of GPs providing after-hours care is only 29% compared to almost a 100% in the Netherlands.²⁵ Furthermore, the average number of 22.448 patients per ED in the Netherlands (total yearly ED visits divided by total number of national EDs) is low compared to the United States, where an average of 26.666 patients visit each ED per year.⁴⁶ Even though the non-urgent self referred patient, who is represented more in non-ECAP EDs, is associated with an increased LOS, we did not find a significant difference in LOS after-hours between hospitals with and without an ECAP. We did find that 45% of non-urgent self-referred ED patients received diagnostic tests compared to only 6% at the GP. This difference in percentage assumes differences in patient characteristics and complaints, but we did not look at causality. Another factor associated with crowding is the number of hospital beds. The Netherlands has 4.7 beds per 1000 inhabitants compared to 3.0 per 1000 inhabitants in the United States and the United Kingdom and 3.2 beds per 1000 inhabitants in Canada.⁴⁷ It seems that the overall healthcare system in the Netherlands plays a large role in the shorter LOS.

Overall, we found that LOS was longer for older patients, patients referred by medical professionals and patients who required a hospital admission. Factors related to a longer LOS probably represent similar patients, for instance patients being admitted to the hospital are often older and referred by a medical professional. This group may benefit from organisational

improvements at the ED such as fast tracks.^{48,49} Our study showed a significantly shorter LOS for patients referred via the radiology department compared to other origins. In the Netherlands, it is a common procedure for GPs during office hours and at several ECAPs to refer the patient directly to the radiology department for ancillary testing. If an abnormality is found, the patient will then be referred to the ED. When no abnormalities are found, the patient will not present at the ED but will be referred back to the GP or receive a self-care advice.

Although a median LOS of 130 minutes is short compared to other western countries, there is room for improvement. Our study found that the majority of patients present between 12 pm and 5 pm leading to an increase of LOS at the beginning of the evening. Spreading out patients over the day has the potential to reduce overall LOS, although experiences to plan ED presentations have not shown to be successful so far.⁵⁰ We found that there was little variation in the overall LOS of ED patients over 24 hours, suggesting that EDs work reasonably efficiently during peak hours, but could improve during quiet hours. Reasons for inefficient patient care during quiet hours, i.e. evenings, nights and weekends, is probably due to a reduction of staff, like the number of on call doctors, nurses on the wards and technicians. This leads to longer waiting times before patients are seen by a doctor, diagnostic tests are ordered and patients are transported to hospital wards. It is likely that there is a nurse and doctors delay as well, when healthcare professionals slow down during quiet times, to be able to work fast and efficient during peak hours. In our experience, backed up by open answers provided in our survey among ED managers (not published), the implementation of EPs raised ED managers' expectations that this would lead to a decrease in ED LOS. Considering the well-established factors associated with increased LOS and the already short LOS in Dutch EDs, EPs have little influence on the LOS. They cannot change patient characteristics or their care pathways. When EPs are managing EDs 24/7 however, they can reduce the number of diagnostic tests and implement clinical ED guidelines and policies. On an individual patient level, this might lead to a reduction in LOS.⁵¹

Emergency Care Access Points (ECAP)

Providing after-hours emergency care is a challenge in many countries. In Western Europe, the GP plays a significant role in providing after-hours care, with 77% of the GPs in Italy, 89% in the UK and 97% in the Netherlands providing after-hours arrangements.⁵² Across Europe, different models of after-hours primary care exist.^{53,54} Since 2000, large-scale GP cooperatives (GPCs) have emerged in the Netherlands, with around 130 GPCs serving the Dutch population of nearly 17 million inhabitants.^{55,56} GP cooperatives are open from 5pm till 8am, on weekend days and bank holidays. Almost 90% of the patients call a regional telephone number when they seek medical care and 10% visit the GP cooperative directly. Depending on the complaint and outcome of the telephone triage, patients will either receive a telephone advice, an appointment with a GP at the GPC, a GP home visit or a referral to the ED. With life threatening complaints, the GP can send out an ambulance as well. A GP at the call center supervises the triage nurses in their phone calls.

Also 90% of the GP cooperatives have the same triage system with 5 urgency classes (NTS, Netherlands Triage Standard). Since the start of GPCs in 2000, GPC consumption has increased yearly with up to 244 consults per 1000 inhabitants in 2012, with large regional variations. The last two years show a slight reduction.⁵⁷ Our study showed the same result for patient visits at the GPC with an increasing trend of 13.2% in the three years before the start of an ECAP and a decreasing trend of 3.7% in recent years, after the start of an ECAP. Overall, there was an increase of 30% of patients for consults at the GPC after the implementation of an ECAP. The GPC handles the majority of after-hours patient contacts (88%) and they refer around 5-7% to the ED.^{2,58,59} Despite the implementation of GPCs, patients in many regions can still bypass the GP and visit the ED directly. To reduce healthcare cost and redirect these self-referred patients to the GP, emergency departments and GPCs increasingly collaborate by forming one emergency-care-access-point (ECAP). At an ECAP, there is one desk where patients present and triage outcome decides if the patient is seen at the GPC or at the ED. In recent years more ECAPs have been formed. At ECAPs, GPs treat 76% of the non-urgent self-referred patients that would have presented to the ED before implementing an ECAP.⁶⁰ Although available literature suggests that ECAPs could lead to a reduction of 15-53% of ED visits by redirecting the non-urgent self-referral to the GPC, the influence of an ECAP on ED patient characteristics and flows was still unknown.⁶¹⁻⁶⁶

Patient flows and characteristics

In three different studies, we looked at patient flows after-hours by comparing ECAP EDs with non-ECAP EDs. Implementing an ECAP showed an after-hours decrease of 27% of ED utilisation in our pre-post study over a six-year period. Earlier pre-post pilot-studies conducted over shorter periods have shown decreases ranging from 15-53%.^{7,67-72} In two of our observational studies we compared ECAP EDs with non-ECAP EDs and found differences in the number of self-referred patients (38.7-44.0% versus 15.6-15.9%), referred patients (74.1-74.7% versus 46.8-49.1%), hospital admissions (42.7-45.2% versus 29.0-31.7%) and patients requiring a GP follow-up (4.1-5.0% versus 13.3-16.9%). We found fewer self-referred patients at ECAP EDs compared to non-ECAP EDs. In three of our studies we found that, although ECAP EDs saw less patients compared to non-ECAP EDs, (99.859 versus 113.933) more patients were admitted (32.506 versus 29.883). As expected, our findings show that the implementation of an ECAP does redirect the non-urgent self-referred patient to the GPC. However, we also found that ECAP EDs have a higher admission rate after implementing an ECAP compared to non-ECAP EDs. This might suggest that patients seen at ECAP EDs are more seriously ill or have a higher risk-stratification, especially considering their older age, yet similar presenting complaints. Another finding was that the non-urgent referred patient received more diagnostic tests and had a higher admission rate than the non-urgent self-referred patient. Unfortunately, due to different triage systems used, we could not compare acuity between ED patients. It does seem that the referral status of the patient could also be a deciding factor on admission. With the implementation of an ECAP leading to increased

numbers of referred patients, that in itself could lead to a higher admission rate at an ECAP ED due to an increase of more seriously ill patients or patients with a higher risk-stratification.^{10,61} Furthermore, if patients are referred more to an ECAP ED next door, than to other non-ECAP EDs in the region it will automatically lead to higher admission rates at ECAP EDs compared to non-ECAP EDs. No other studies exist that looked at the influence of ECAPs on patient characteristics and flows, especially admission rates and out-patient clinical follow-up. This makes it difficult to compare studies.

Our study found that, compared to non-ECAP EDs, patients at ECAP EDs had a higher median age (50 years versus 39 years) and presented with less trauma related problems (28.8% versus 33.3%). Finding an older age at ECAP EDs is expected considering previous studies showing a shift of the young non-urgent male to the GPC.^{7,59,70} Despite the differences in characteristics and flows, we found no differences in presented complaints. Patients at both settings mostly presented with trauma, localised abdominal pain and shortness of breath. These findings are supported by previous studies in Europe and published statistics from Canada, although those studies also have chest pain as most presented complaint.^{7,30,31,74-78} We found small differences in discharged diagnoses with fewer patients with wounds and intoxications and more patients with specific abdominal diagnosis at ECAP EDs compared to non-ECAP EDs.

The GPC deals with the majority of all after hours patient contacts (88%) and refers around 5-7% to the ED.^{2,58,79} The higher percentage of admissions in combination with the difference in the discharge diagnosis with similar presenting complaints, suggests that the GPCs correctly refer to the ED. For the ED, however it is not clear if all admitted patients are admitted on the basis of their clinical presentation or partly on their referral status as well. It shows that presenting complaints are not diagnoses-specific and other factors like age and referral seem to pre-select patients that are seriously ill or have a higher risk-stratification.⁸⁰

Methodological considerations

In this thesis we present a narrative review, a web-based survey and four observational studies. We described emergency department characteristics and the influence of ECAPs. In each chapter we have discussed specific strengths and limitations. Most of the studies were descriptive and required sampling and data collection from third parties, which could have caused reporting and processing errors as well as biases due to non-response, (web-based survey) incomplete response (missing data) and inaccurate response (coding errors). As most designs were observational we could not attribute changes in outcomes with high certainty to changes in the organisation or staffing. We explored a reasonable new model of after-hours care and focused mainly on exploration. We therefore pragmatically chose mostly observational study designs. Our studies were done in the Netherlands, a country with a well-developed and accessible primary care system. Conclusions might therefore not be applicable to countries where primary care is

less accessible or less comprehensive, regarding ambulatory care-sensitive conditions. There was little research available on the influence of ECAPs on EDs for national comparison and differences in organisation and ED characteristics make it difficult to compare with models worldwide. We used multiple, different sized EDs with and without ECAPs throughout the country and looked at various characteristics. Although there are local variations, overall findings make it possible to draw general conclusions on the effect of ECAPS on EDs.

Implications for practice

Emergency departments

Emergency departments in the Netherlands are in different stages of development. In recent years a number of EDs have closed, and the number of ED visits has declined after an initial increase. Our research shows that this reduction is largely due to the implementation of ECAPs. The Netherlands on average still sees far less patients per ED with a shorter length of stay than other western countries like the US, Canada and the UK. Compared to most other countries, patients at Dutch EDs are older, mostly referred and a higher percentage requires a hospital admission. When EDs and GP cooperatives form an ECAP, the differences in patient characteristics are even more pronounced. With the increasing trend of EDs collaborating with GP cooperatives, forming an ECAP, the emergency department will be more at the receiving end of emergency care, in close working relationship with the GP and the ambulance services.

Staff and training

Politicians and stakeholders in healthcare face emergency medical care in the Netherlands with an increasing interest. This is due to crowding, increasing costs, criticism on the quality of emergency care, restructuring after-hours primary care and the introduction of a training programme for emergency physicians (EPs). A white paper from the Netherlands Health Insures, published in 2013, started a debate on the best way to reduce costs and achieve better quality in emergency care.⁸¹ One of the key points of this report is the implementation of different levels of ED care, ranging from basic care to high-level care. High-level care EDs are designated for patients with specific diagnoses like ruptured abdominal aneurysms or myocardial infarctions. This increased exposure to specific diagnoses should lead to more experience and thus better care and treatment outcomes for patients attending the ED. Our study showed that patient characteristics and presenting complaints at EDs are not diagnosis-specific. Although there is evidence that increased exposure leads to better outcomes in specialised care, i.e. surgical procedures and myocardial infarctions, the majority of ED patients present with symptoms rather than a predefined diagnosis.⁸²⁻⁸⁴ This means that ED patients benefit more from early recognition leading to timely treatment and thus better outcomes, especially in time-sensitive conditions such as strokes, sepsis or myocardial infarctions.⁸⁵ Early recognition is highly dependant on the experience of the treating physician, who should therefore be well trained in emergency

medicine and have sufficient exposure. Decreasing the numbers of existing EDs and thus enlarge the remaining ones, could lead to more exposure and thus experience.

The emergency medicine training scheme started in 2000 and, up to mid 2014, more than 400 EPs have successfully finished their training scheme.⁸⁶ We found that more EDs are being staffed with EPs and that they have a positive effect on the quality of care by implementing more clinical audit activities, develop specific acute care guidelines, perform more research in acute care medicine and enhance efficiency.⁸⁷ Furthermore, with numbers of emergency physicians increasing, it can be expected that they will soon provide care 24/7 in all operating EDs in the Netherlands. This will increase the quality of care because senior doctors experience adds to better disposition decisions and also improve patient flow.⁸⁸ Care could even be further improved when EPs gain more experience and training by extending their training scheme to five years. This will bring the training program to a level similar to other European medical specialists training schemes.⁸⁹ So, instead of only reducing the numbers of EDs and profiling the remaining EDs, stakeholders should focus more on staffing EDs 24/7 with sufficient numbers of well-trained EPs so early recognition of time-sensitive conditions is guaranteed, whilst the LOS and quality of care of less-urgent patients is maintained. Furthermore EPs can implement ED specific protocols and fast tracks to reduce in-hospital mortality.²⁶ Having 24/7 EPs working together with 24/7 ED nurses will give opportunities to implement simulation trainings for teams which improves team communication and lead to increased patient safety and decreased morbidity and mortality.⁹⁰ This requires sufficient numbers of EPs, which could be a quality indicator for ED visitations.

Patients

EDs in the Netherlands see far less patients then EDs in other western countries. Furthermore, patients presenting at emergency departments in the Netherlands have different characteristics compared to other countries. They are older, mostly referred, present with different complaints and have a higher likelihood of being admitted. Our study showed that presenting complaints at EDs are not diagnosis-specific and other factors like age and referral seem to pre-select patients that are seriously ill or have a higher risk-stratification.⁷⁹ More attention should be given to hand-over information like, vital signs, pain assessment and treatment already started by the GP or ambulance services. This is especially important for low acuity patients where emergency physician contact with paramedics is uncommon.⁹¹ Developing overall treatment guidelines that involve all emergency care providers, could lead to better care, early treatment interventions, and timely requests for appropriate diagnostic tests and therefore improve quality of care.

Crowding

The median LOS in Dutch EDs is relatively short, compared to internationally published LOS. Although integration of EDs with after-hours primary care was not directly related to LOS, the strong primary care system probably contributed to the overall LOS of EDs in the Netherlands.

LOS may even decrease by strengthening primary healthcare after-hours, through implementing more ECAPs and give GPs at ECAPs access to ancillary services, like radiology and laboratory tests where we found a shorter LOS. A further improvement to reduce LOS would be point of care testing.⁹² Also the presence of more EPs could lead to a decrease in LOS for individual patients, as they request less diagnostic tests compared to other physicians in the ED.⁵¹ At the same time though, EPs have introduced procedural sedation to Dutch EDs as well as bedside ultrasound. These procedures lead to a longer LOS, not only for the patients involved, but probably also for other patients having to wait longer to see a physician. Although these procedures might increase the LOS, it does improve quality of care.⁹³ Making an inventory of the average number of hospital admissions via the ED could streamline available in-hospital beds. This is correlated more with ED LOS than the number of patients that visit the ED each day.⁹⁴ Implementing fast tracks for most presented complaints might reduce waiting time on diagnostic tests, although more insight into risk factors is needed to guarantee patient safety in such fast tracks. There is also evidence, though limited, that team triage, with a physician in the team, could reduce LOS.⁹⁵ We found two peaks in the LOS of ED patients, one early in the day, before morning handover and one in the early evening. The early evening peak can be reduced if involved medical specialists visit the ED before their evening hand-over and decide on patient treatments and admission. Although previous trials in planning ED visits have not been successful in the past, a 24/7 presence of an EP, instead of multiple specialists involved, might make it more successful to spread ED visits.⁵⁰

Emergency Care Access Points

In 2010 there were 128 GPCs, of which 76 had a co-location with the ED, either on the same grounds or in the hospital building. Only four GPCs were collaborating with the ED and formed an ECAP.⁷⁹ Although exact numbers are not available, more GPCs have collaborated with EDs since then and formed one Emergency Care Access Point. The most important reason for this is to reduce costs by redirecting the non-urgent self-referred patient to the GP. Considering the 27% shift of patients at an ECAP ED we found, this goal is reached, especially considering that a consultation at a GPC is three times cheaper than at the ED.⁹⁶ Furthermore, there is an overall decrease in ED visits in the Netherlands since more ECAPs have been formed.^{8,9} Changes in healthcare regulations in recent years (increased own risk payments) has probably contributed to this decrease as well. In contrast to the decrease in overall ED utilisation, compared to non-ECAP EDs, we found a higher referral and admission rate at ECAP EDs and more patients followed up at the out-patient clinic. To a point, this seems logical due to a selection of more complex and urgent patients by GPs. GPCs already referred around 5-7% of patients to the ED and this is likely to increase if all self-referred patients are redirected from the ED to the GPC.⁶⁰ Furthermore, it is likely that the implementation of an ECAP has supplied an induced demand. More patients have visited an ECAP (ED and GPC) after the implementation than before. At an ECAP, GPs are not

familiar with the patients that they see, since the majority is not from their own practice. This lowers the threshold to refer a patient to the ED.⁹⁷

Overall, implementing more ECAPs will lead to a further reduction of ED utilisation and health care costs, although the increased numbers of admission and out patient follow-up warrants caution.

We included three ECAPs in our study and they all varied in the way they worked. There were ECAPs where GPs had the possibility to request ancillary tests (x-rays and lab) but not all had this possibility. Although we did not find a difference in the LOS of ED patients between ECAP EDs and non-ECAP EDs, we did find that ancillary testing is associated with a decreased LOS. In fact, it results in a decrease of referred patients and therefore a decrease in overall ED utilisation as well. GPs should implement this both during office-hours and ECAP hours. This will gain efficiency, reduce costs and decrease ED LOS.

Although the EM training programme was implemented in Dutch EDs to improve overall quality of care, EPs originally only treated self-referred patients.⁹⁸ With the implementation of ECAPs, the majority of patients seen at the ED are referred patients, suggesting that EPs see fewer patients. In reality, EPs and GPs at ECAPs work together well, with the GP increasingly referring patients to the EP instead of other medical specialties. For the seriously ill patient, this will improve care, especially when they benefit from early recognition of time-sensitive conditions i.e. sepsis of unknown origin. It is therefore important that GPs are also well trained in emergency care. For the less urgent patient, one treating EP will reduce LOS and improve quality of care. For instance, the patient that has collapsed and has a head wound whilst on anticoagulants can be treated by one physician instead of the cardiologist (collapse), the surgeon (wound) and the neurologist (head trauma whilst on anti-coagulants). Caution is needed when there is an unnecessary treatment delay, i.e. the patient with a high suspicion of a myocardial infarction should be directly referred to the cardiologist for early intervention.

We found three different triage systems being used. This makes it difficult to compare acuity of patients between different healthcare providers. At the moment, there is one evaluated triage system; the Netherlands Triage Standard (NTS) that can be used in all emergency departments, GP cooperatives and ambulance services.⁹⁹ It is advisable that all emergency care providers, especially when working together in an ECAP, use the same triage system. ECAPs should look at best practice and implement this nationally.

Recommendations for future research

Across the world, policy makers are looking for the optimal organisation of emergency care.¹⁰⁰⁻¹⁰² Our study suggests that high involvement of primary care providers in emergency care can

optimise the efficiency of ED utilisation. Patients with serious conditions benefit from the facilities and skills at the ED, while patients with less serious conditions are treated in a primary care setting, reducing ED utilisation. In general the emergency department is at the receiving end of emergency care, but in close working relationship with the GP and the ambulance services. The place for the ED within the overall system of emergency care can however vary with the level of care provided and the implementation of ECAPs.

Emergency departments

Staffing and training

There is a diversity of professionals working in Dutch ED's. All EDs employ emergency medicine licensed nurses as well as nurses in training; however their room to practice independently is more limited than in some other countries in the world. For physicians there is a big variety, depending on the size of the ED. Although there is an increase in EPs, young non-trainees are still treating patients and are supervised by medical specialists within the hospital. These young physicians tend to work at EDs to gain experience in emergency care while they wait for a traineeship in various specialties. The larger EDs are staffed with a combination of non-trainees and trainees for the bigger specialties, including surgery, internal medicine, cardiology and paediatric care. In almost 80% of the EDs, at least one EP is employed.¹⁰ It has become a common rule that all surgical trainees need to follow an ATLS course. Similar courses for non-surgical trainees are not compulsory, although it is expected that a physician working in the ED has successfully finished an ABCDE course.¹⁰³ There is increasing interest in implementing physician assistants or nurse practitioners in the ED where they might improve flow and decrease LOS. Although they seem successful at GPCs in the Netherlands and EDs in the United States, more research is needed to see if implementation in Dutch EDs would lead to a decrease in LOS and be cost-effective without loss of quality of care.^{104,105} With increasing numbers of EPs and other new professionals, more research is needed to gain insight into the effect of staffing EDs and the delivered quality of care, costs and length of stay of ED patients.

We looked at emergency department patient characteristics in the Netherlands and found large variations between EDs. Our study suggests that increasing the size of EDs in the Netherlands could potentially improve quality registrations and meetings and therefore patient safety and quality of care. We see a similar occurrence in GP practices where larger practices seem to have more safety features present.¹⁰⁶ Though audit and feedback was found to have a moderately positive effect in the most recent Cochrane review, our study cannot identify causal effects.¹⁰⁷ With the implementation of ED visitations of the Netherlands Society of Emergency Physicians, EDs will raise their quality of care, but precise quality indicators still need to be determined. There are already indicators like door to needle time for myocardial infarction and stroke patients and time to operation for hip fractures, but more research into best practice and ED

quality indicators is needed.¹⁰⁸ Especially since most indicators are based on specific ED diagnoses, not on presenting complaints and ED logistics.

Patients

We found that a third of patients presenting to the ED is self-referred. Overall, around 36% of ED patients are admitted and around 28% is followed up at an out-patient clinic. The high number of follow-up contacts at out-patient clinics, in particular for non-urgent ED contacts, need to be studied in more detail. The figure may reflect the patient population at EDs, but it may also suggest opportunities for improving the efficiency of planning follow-up contacts. A better insight into the reasons for an out-patient clinic contact could help decision makers to adjust flows and improve efficiency in emergency care. Since referred patients have more diagnostic tests performed and are more likely to be admitted, more insight is needed into the reasons for GPs to refer a patient to the ED (sicker patient, no GP possibility for ancillary testing, ED is just next door at an ECAP and thus convenient) and for ED physicians to admit a patient (medically needed, referred by GP).

Our study showed that a third of patients presented to the ED with a trauma related problem. Patients with simple trauma's and small wounds are ideal for fast tracks, leading to a decreased LOS.¹⁰⁹ Two other regularly presented complaints were abdominal pain and respiratory complaints. Further insight into these presenting complaints, requested diagnostic tests and risk stratification is needed to develop guidelines, implement fast tracks, reduce LOS and improve quality of care. This is especially important for the aging ED population, who will benefit from a shorter LOS in the ED.

We found no differences in LOS for patients presenting at ECAP EDs compared to non-ECAP EDs. We did find that more patients were admitted at ECAP EDs even when there was no difference in presenting complaint. Although patient characteristics and referral status seem to be a proxy for a hospital admission, clinical factors such as acuity, diagnostic tests and treatments received could be significant predictors of ED LOS as well. This should be studied to safely implement fast tracks and reduce LOS.

We found an overall median LOS of 130 minutes but there were variations between the participating hospitals. Research into best practice is needed to improve the already short LOS.

We found that hospitals were very willing to share their data for research purposes, but access to data seemed difficult and at times impossible. Research of ED data is necessary to help develop the best care for patients. It will also give insight into trends and complaints and diseases that could be preventable. An effort should be made to implement a national database, accessible for

research. As an independent organisation, the Netherlands Society of Emergency Physicians should preferably do this.

Emergency Care Access Point

We looked at a reasonably new model of after-hours care and focused mainly on exploration. The introduction of an ECAP in the Netherlands is associated with substantial changes in the flow of patients, including an overall decrease in ED utilisation, a decrease of self-referring ED patients and a higher probability of hospital admission and clinical follow-up for referred patients presenting at ECAP EDs. The latter suggesting that either the proportion of patients presenting to the ED with a higher acuity increased or the threshold for admitting referred patients is lower than for self-referred patients. Many non-urgent ED patients frequently received an X-ray. Access to X-ray facilities and laboratory tests by GPs in emergency care may be explored, particularly at ECAPs. This might redirect the flow of patients and enhance the efficiency of emergency care. This will optimise the ECAP setting, reduce healthcare costs and maintain quality of care. Moreover, extending opening hours of the GPC or staffing the ED 24/7 with EPs might contribute to the efficient treatment of self-referring patients. Our study gave an explorative overview of flows in ECAP settings, but more studies need to be done to find the most efficient form whilst maintaining quality of care. This could be a 24/7 ECAP, access to ancillary testing for GPCs or consultations of hospital specialist at the GPC.

Although the number is increasing, there are only a few national medical protocols for emergency care and most of the existing ones are local.¹¹⁰ Developing emergency care guidelines involving primary care as well as ED care is needed. This could lead to a decrease in diagnostic tests, hospital admissions and out-patient follow-up. Finally we see a great variation in the triage systems that are being used. An overall triage system (the Netherlands Triage Standard, NTS) for emergency care is available for use in emergency departments, GP cooperatives, and ambulance services.^{100,111,112} More research in the use of NTS for ambulance services is needed to gain insight into the safety of using the same triage system by all three emergency care providers.

In conclusion, emergency departments in the Netherlands see far less patients than in other western countries. They are older, mostly referred and have a higher likelihood of being admitted or followed up at the out-patient clinic. There is room for improvement in the number of diagnostic tests ordered for non-urgent (referred) patients. This will lead to a decrease of the already short LOS. Implementing an ECAP has reached the goal of redirecting the non-urgent self-referred patient to the GP. It has however led to an increase in hospital admissions and out-patient follow up for ECAP EDs. In order to reduce healthcare costs and maintain quality of care, more insight into this side effect is needed to find the most efficient form of collaboration between EDs and primary care.

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Summary

In **chapter 1** we provide an introduction, resulting in the research questions that are answered in this thesis

Emergency departments

In **chapter 2** we present a narrative review describing the development and structure of emergency medicine in the Netherlands, with a special focus on emergency departments (EDs). Emergency medicine changed dramatically in the Netherlands since the year 2000. We addressed the development of emergency medicine, how EDs fit in the overall system of emergency care, which patients present to emergency departments, how the ED is staffed and the interaction between emergency physicians (EPs) and both primary care and hospital specialists. We performed a comprehensive search of published research, policy reports and updated Dutch websites on acute care. We included publications that referred to emergency care including emergency departments, GP cooperatives and emergency medical services. The literature search identified 25 eligible papers. We also included 7 reports and 2 PhD theses. The majority of research papers fell into two categories: the implementation of emergency physicians and their training programme and the changes of emergency department patient characteristics after implementing GP cooperatives. We found that emergency departments in the Netherlands are in different stages of development. The presence of EPs is increasing and more EDs are staffed with EPs. Furthermore, we found an increase of integrated GP cooperatives. The characteristics of future patients in Dutch EDs will depend on future plans of implementing different ED levels of care, varying from basic care to high level care and implementation of integrated GP cooperatives. The lack of empirical research in the field points out the need for studies on Dutch EDs, in particular gaining insight into general ED features and the influence of integrated GP cooperatives on these features.

Chapter 3 describes a cross sectional web-based survey performed on emergency department data about the year 2008 or 2009 in all 105 Dutch hospitals with an emergency department. Several policy reports stated that the quality of emergency care should be improved and that emergency physicians play a large role in these quality improvements. We documented which ED specific courses were attended by physicians working in the ED (list of 4 courses) and which clinical audit activities were implemented (list of 6 activities). The choice of courses and clinical audits was based on those mentioned in published quality reports and in national debates on emergency care. We compared EDs with and without EPs. Response to our survey was 67%. EPs worked significantly more often in larger EDs. In bivariate analyses, we found that in EDs with EPs, physicians attended significantly more courses (mean of 2.47 versus 1.96, $P=0.001$) and implemented more clinical activities (mean of 5.61 vs. 5.12, $P=0.008$) than EDs without EPs. These differences remained significant in the regression analyses for both number of courses ($P=0.000$) and implemented clinical activities ($P=0.032$).

This study showed that EPs are significantly more present in larger EDs, in EDs where there is more continuing professional education and where there are more clinical audit activities. Our findings suggest that the presence of emergency physicians is positively associated with quality of emergency care, but prospective research is required to examine causality.

In **Chapter 4** we describe a retrospective record review, concerning patients who had visited a GP cooperative or an emergency department. In most countries different health care providers are involved in emergency care. In the Netherlands, after-hours care is provided by general practitioner cooperatives (GPc) and emergency departments (EDs). Our aim was to describe the flow of patients attending emergency care in these settings. Recorded information included urgency, diagnostic tests, and follow-up contacts. We determined patient flows in a GP cooperative and an ED for urgent contacts and non-urgent contacts. We included 319 GPc contacts and 356 ED contacts, of which 78% were non-urgent. The majority of GPc contacts were completed at the GPc without follow-up; 37% of non-urgent patients had a follow-up contact, usually with primary care. Only 5% of non-urgent GPc patients received diagnostic tests compared to 63% of non-urgent ED patients (mostly X-rays). The majority of non-urgent ED patients (88%) had a follow-up contact, usually at an out-patient clinic (67%). Of urgent ED patients, the majority had a follow-up contact (85%), mostly with an out-patient clinic (74%). Although most after-hours care patients present with non-urgent health problems, at the ED they are more likely to receive diagnostic tests and follow-up contacts. This may reflect differences in patient populations between the ED and GP cooperative or suggests opportunities for improving efficiency of planning follow-up contact.

Collaboration between emergency departments and GP cooperatives (ECAP)

In **Chapter 5** we present a new model, an emergency-care-access-point (ECAP) for after-hours emergency care. This model is emerging in the Netherlands. At an ECAP, there is only one entrance, where triage decides if patients are seen by the GP or at the ED. This study assessed the effect of an ECAP on emergency department (ED) utilisation and patient flows. We collected, routinely recorded clinical ED patient data, covering a six-year period. We used a segmented regression analysis to analyse after-hours changes over time. A total of 59.182 patients attended the ED before the start of the ECAP and 51.513 patients after, a decrease of 13% during ECAP hours. At the same time ED patient numbers increased with 14% during non-ECAP hours. The number of self-referred ED patients decreased with 99.5% (OR 0.003; 95%CI 0.002-0.004). The number of referred patients increased with 213.4% and ED hospital admissions increased with 20.2%. The number of planned outpatient clinical follow up increased with 5.8% (OR 1.968; 95% CI 1.870–2.071). The latter changed from fewer contacts to more contacts (OR 1.015; 95%CI 1.013-1.017). Consultations at the regional GP-cooperative (three locations) increased with 26.0% (183.782 versus 232.246).

The implementation of an ECAP resulted in a decrease in ED utilisation, a near absence of self-referring patients and a higher probability of hospital admission and clinical follow-up. This either suggests an increase of ED patients with a higher acuity or a lower threshold of admitting referred patients compared to self-referred patients. Overall, increased collaboration with after-hours primary care and emergency care seemed to optimise ED utilisation.

Chapter 6 describes an observational multi-center study exploring differences in characteristics and care pathways and their link with LOS, comparing ECAP EDs and non-ECAP EDs. In many western countries ED crowding is a major problem. The Netherlands has a well-developed primary care system, which increasingly collaborates with hospital emergency departments. Insight into crowding in Dutch EDs is limited. We looked at 7000 medical records of patients visiting the ED in 2013. We included seven emergency departments spread over the Netherlands, three with an integrated GP cooperative forming one emergency-care-access-point (ECAP) and four without an ECAP. The mean age of ED patients was 47 years, 51.9% was male and 36.3% required a hospital admission. Compared to non-ECAP EDs, patients at ECAP EDs were older (47.6 versus 42.1 years), had a higher referral rate (74.1% versus 49.1%) and a higher admission rate (42.7% versus 31.7%).

The median LOS of ED visits was 130 minutes (IQR 79.0-140.0), which increased with patients' age. Random coefficient regression analysis showed that LOS for patients referred by medical professionals (GP or ambulance staff) was 32.9 minutes longer compared to self-referred patients (95%CI 27.7-38.2 min). LOS for patients admitted to the hospital was 41.2 minutes longer compared to patients followed-up at the outpatient clinic (95%CI 35.3-46.6 min), 49.9 minutes longer compared to patients followed-up with their GP (95%CI 41.5-58.3 min) and 44.6 minutes longer compared to patients who did not receive follow-up (95%CI 38.3-51.0 min). There was no difference in LOS between hospitals with or without an ECAP. The median LOS in Dutch EDs is relatively short, compared to international LOS. This study showed that ECAPs have an influence on ED characteristics and care pathways. ECAP EDs see older patients, more referrals and higher admission rates, all factors associated with a longer LOS in this study. With 130 minutes, though, the median LOS in Dutch EDs is relatively short. Although integration of EDs with after-hours primary care was not related to LOS, the strong primary care system probably contributed to the overall efficiency of EDs in the Netherlands. LOS may decrease more, by strengthening primary healthcare after hours, through implementing GP access to ancillary services, like radiology and laboratory tests and by collaboration guidelines of GP and ED care.

In **Chapter 7** we present a retrospective observational study. In the Netherlands, more emergency departments (ED) and GP cooperatives (GPC) collaborate after-hours and form one emergency-care-access-point (ECAP). The ECAP is implemented to reduce healthcare costs by redirecting the non-urgent self-referral back to the GP. At non-ECAP EDs patients can still bypass

the GP and visit the ED. This implies a difference in patient presentation between ECAP and non-ECAP EDs. Therefore, the primary outcome was the difference in presenting complaint and discharge diagnosis comparing EDs with and without an ECAP starting 1 February 2013. We looked at 1800 patient samples from six emergency departments spread over the Netherlands, three with and three without an ECAP. We collected time and date of presentation, sex, age, presenting complaint and discharge diagnosis, origin and follow up.

At ECAP EDs the average age was 47.8 years old, 74.7% of patients were referred and 45.2% required a hospital admission. At non-ECAP EDs the average age was 41.3 years old, 46.8% of patients were referred and 29.0% required a hospital admission. ($P < 0.01$) Post-hoc grouping showed similar complaints prevalence for ECAP and non ECAP EDs, namely trauma (25.7% versus 29.7%), abdominal pain (12.1% versus 10.9%) and general symptoms (7.8% versus 4.8%) ($P = 0.07$). After post-hoc grouping specific discharge diagnosis, the three most prevalent discharge diagnoses were fractures and dislocations (10.8%), sprains and strains (10.4%) and respiratory infections (6.8%) for ECAP EDs compared to fractures and dislocations (10.7%), wounds (9.3%) and sprains and strains (8.9%) for non ECAP EDs ($P < 0.01$). This study showed that even with different patient characteristics and care pathways, there was no difference in presenting complaints at EDs with or without an ECAP. It is not the presenting complaint, but more so the patient characteristic, like age and referral that seem a proxy for severe illness diagnosis and a hospital admission.

In **chapter 8** we present the general discussion of this thesis, where we summarise the main findings and interpretations. Emergency departments in the Netherlands see far less patients per capita and have a shorter length of stay than other western countries like the US, Canada and the UK. Overall patients at Dutch EDs are older, mostly referred and a higher percentage requires a hospital admission. When EDs and GP cooperatives form an ECAP, the differences in patient characteristics are even more pronounced. Patient characteristics and referral status is more predictive for a hospital admission and out-patient follow up than the presenting complaint. We also discuss some methodological considerations and reflect on the implications for practice and future research. Although, the implementation of both ECAPs and EPs has a positive influence on the emergency care system in the Netherlands, there is room for improvement. If GPs at ECAPs have the same access to ancillary tests as they do during office-hours we expect a further reduction of overall ED utilisation and a decrease in length of stay for referred ED patients. Furthermore, with increasing numbers of emergency physicians, it is just a matter of time before they provide care 24/7 in all operating EDs in the Netherlands. This will increase the quality of care, not only because of more experienced doctors at the bedside, but also because EDs with EPs implement more clinical audit activities, develop specific acute care guidelines and perform more research in acute care medicine.

Samenvatting

Hoofdstuk 1 bevat de inleiding, resulterend in onderzoeksvragen voor de studies in dit proefschrift.

Spoedeisende hulp afdelingen

In **hoofdstuk 2** presenteren we een verhalend review, waarin we de ontwikkelingen van de spoedeisende geneeskunde in Nederland beschrijven en waarbij de nadruk ligt op de spoedeisende hulp afdelingen (SEHs). De spoedeisende geneeskunde in Nederland heeft enorme veranderingen doorgemaakt sinds het jaar 2000. We beschrijven de ontwikkeling in de spoedeisende geneeskunde, de positie van de SEH binnen de acute zorg keten, welke patiënten zich op de SEH presenteren, welke functies er vertegenwoordigd zijn op de SEH en tenslotte de samenwerking tussen spoedeisende hulp artsen (SEH-artsen), huisartsen en specialisten. Er is een uitgebreide zoekactie verricht naar gepubliceerde artikelen en "grijze" literatuur met rapporten over spoedzorg. Publicaties verwijzend naar spoedzorg met daarin spoedeisende hulp afdelingen, huisartsenposten (HAPs) en ambulances werden geïnccludeerd. De literatuur zoekactie leverde 25 bruikbare artikelen, 7 beleidsrapporten en 2 proefschriften op. De meerderheid van de artikelen viel in twee categorieën: implementatie en opleiding van SEH-artsen en de veranderingen in SEH patiënt kenmerken na implementatie van HAPs.

De SEHs zitten in verschillende fases van ontwikkeling. Het aantal SEH-artsen groeit en meer SEHs worden bemand met SEH-artsen. Daarnaast neemt het aantal geïntegreerde HAP-SEH (spoedposten) toe. Hoe de SEH patiënt er in de toekomst uit zal zien is onder andere afhankelijk van de ontwikkeling van de verschillende SEH-niveaus, variërend van basis zorg tot gespecialiseerde zorg, en de implementatie van meer spoedposten. Het gebrek aan empirisch onderzoek op de Nederlandse SEH, meer specifiek, het gebrek aan inzicht in algemene SEH kenmerken en de invloed van spoedposten, noodzaakt tot meer onderzoek.

Hoofdstuk 3 beschrijft een cross-sectioneel vragenlijst onderzoek naar organisatie kenmerken uitgevoerd over de jaren 2008-2009 onder alle 105 Nederlandse SEHs. Verschillende beleidsrapporten beschrijven dat de kwaliteit van de spoedzorg moet verbeteren en dat de SEH-arts hier een belangrijke rol in kan spelen. We verzamelden welke van de vier specifieke SEH-cursussen werden gevolgd door artsen werkzaam op de SEH en welke van de zes klinische audit activiteiten waren geïmplementeerd. De keuze van deze cursussen en audits was gebaseerd op de inhoud van gepubliceerde kwaliteit rapporten en nationale discussies over de spoedzorg. We vergeleken SEHs met en zonder SEH-artsen. De respons op de vragenlijst was 67%. SEH-artsen werkten significant vaker op grotere SEHs. Bivariate analyses lieten zien dat op SEHs waar SEH artsen werkten, artsen significant meer cursussen volgden (gemiddelde van 2.47 versus 1.96, $P=0.001$) en SEHs meer kwaliteit audits geïmplementeerd hadden (gemiddelde van 5.61 versus 5.12, $P=0.008$). In de regressie analyse, waarin werd gecorrigeerd voor versturende factoren,

bleven deze verschillen significant voor zowel het aantal gevolgde cursussen ($P=0.000$) als het aantal geïmplementeerde kwaliteit audits ($P=0.032$). Deze studie liet dus zien dat er significant meer SEH-artsen werkten op grotere SEHs, op SEHs waar artsen meer cursussen volgden en waar meer kwaliteit audits geïmplementeerd werden. Onze bevindingen suggereren dat de aanwezigheid van een SEH-arts positief geassocieerd is met kwaliteit van acute zorg, maar prospectief onderzoek is nodig om causaliteit aan te tonen.

In **hoofdstuk 4** beschrijven we een cross-sectioneel dossieronderzoek van patiënten die een huisartsen post of een SEH bezocht hadden. In Nederland wordt spoedzorg buiten kantooruren verzorgd door huisartsenposten (HAPs) en spoedeisende hulp afdelingen (SEHs). Ons doel was om de patiënten stromen in deze setting te beschrijven. Verzamelde data bevatte de triage uitkomst, de verrichte diagnostische testen en het vervolg traject. We maakten een stroom diagram voor patiënten met een hoge en een lage urgentie voor zowel de HAP als de SEH. Er werden 319 HAP contacten en 356 SEH contacten geïnccludeerd, waarvan 78% medisch niet urgent was. De meerderheid van de HAP contacten werd op de HAP afgerond zonder vervolg actie en 37% van de niet-urgente patiënten kreeg een vervolg consult, meestal in de eerste lijn. Van de niet-urgente HAP patiënten onderging maar 5% diagnostisch onderzoek in vergelijking met 63% van de niet-urgente SEH patiënten (meestal röntgenfoto's). De meerderheid van de niet-urgente SEH patiënten (83%), waarbij ook diagnostisch onderzoek werd verricht, kregen een vervolg consult, meestal op de polikliniek (67%). In de groep urgente SEH patiënten kreeg 85% een vervolg consult, waarvan de meerderheid op de polikliniek (74%). Hoewel de meerderheid van de patiënten, buiten kantooruren, zich presenteert met niet-urgente klachten, hebben zij op de SEH een grote kans om diagnostische onderzoeken en een vervolg consult te krijgen. Het verschil is deels te verklaren op basis van verschillen in patiënten populaties SEH en HAP, maar is waarschijnlijk ook te verklaren uit verschillen in handelswijze, waarbij de SEH neigt tot relatief vaker aanvraag van diagnostiek en vaker de patiënt op de polikliniek terug bestelt.

Samenwerking tussen de spoedeisende hulp en de huisartsenpost. (spoedpost)

In **hoofdstuk 5** presenteren we nieuw model, de geïntegreerde HAP-SEH, oftewel de spoedpost voor spoedzorg buiten kantoor uren. Dit model wordt steeds vaker geïmplementeerd in Nederland. Bij een spoedpost is maar één ingang tot de spoedzorg waar aan de hand van triage wordt bepaald of een patiënt gezien wordt door de huisarts of op de SEH. Deze studie heeft gekeken naar het effect van een spoedpost op de contactfrequentie op de SEH. Er werd data verzameld over een periode van 6 jaar, 3 jaar voor de implementatie en 3 jaar na de implementatie van een spoedpost. Met behulp van een regressie analyse werd de verandering in de tijd geanalyseerd. In totaal presenteerde zich 59.182 patiënten op de SEH voor de implementatie van een spoedpost en 51.513 patiënten na de implementatie van een spoedpost, een reductie van 13% tijdens openingstijden van de spoedpost. Het aantal zelfverwijzers op de

SEH reduceerde met 99.5% (OR 0.003; 95%BI 0.002-0.004). Het aantal verwezen patiënten op de SEH nam toe met 213.4% en het aantal opnames vanaf de SEH met 20.2%. Het aantal geplande polikliniek bezoeken nam toe met 5.8% (OR 1.968; 95%BI 1.870-2.071). Het aantal polikliniekbezoeken veranderde van een afname voor de start van een spoedpost in een toename na de start van een spoedpost. (OR 1.015; BI 1.013-1.017). Het aantal consulten op de huisartsenpost (drie locaties) nam toe met 26.0% (183.782 versus 232.246). De implementatie van een spoedpost resulteerde in een bijna totale afname van het aantal zelfverwijzers op de SEH en een hogere waarschijnlijkheid om na een SEH bezoek opgenomen te worden of een poliklinische afspraak te krijgen. Dit suggereert een toename van patiënten op de SEH met ernstiger aandoeningen en een lagere drempel om verwezen patiënten op te nemen in vergelijking met zelfverwijzers. Concluderend, zorgt de spoedpost ervoor dat er vrijwel geen zelfverwijzers meer op de SEH zijn. Door de selectiefunctie van de HAP nam de relatieve zorgzwaarte op de SEH wel toe.

Hoofdstuk 6 beschrijft een observationele multi-center studie, waarbij gekeken is naar de verschillen in patiënt kenmerken en stromen en de associatie met de verblijfsduur op de SEH. Hierbij zijn SEHs met een spoedpost vergeleken met SEHs zonder spoedpost.

In veel westerse landen is drukte en lange wachttijden op een SEH een groot probleem. Er is echter weinig informatie over drukte op de Nederlandse SEH. In Nederland is de huisartsen zorg goed ontwikkeld en wordt steeds vaker samen gewerkt met SEHs in de vorm van een spoedpost. We bestudeerden 7000 statussen van patiënten die in 2013 de SEH bezochten. Daarbij werden 7 SEHs verspreid over Nederland geïnccludeerd, drie met een spoedpost en vier zonder. De gemiddelde leeftijd van de SEH patiënten was 47 jaar, 51.9% was man en 36.3% werd opgenomen. Op SEHs met een spoedpost waren de patiënten ouder (47.6 versus 42.1), vaker verwezen (74.1% versus 49.1%) en werden vaker opgenomen (42.7% versus 31.7%) in vergelijking met SEHs zonder spoedpost.

The mediane verblijfsduur was 130 minuten (IQR 79.0-140.0) en deze nam toe met de leeftijd van de patiënten. De random coëfficiënt regressie analyse liet zien dat de verblijfsduur voor verwezen patiënten (huisarts en ambulance) 32.9 minuten langer was dan voor zelfverwijzers (95%BI 27.7-38.3 min). De verblijfsduur voor patiënten die opgenomen werden was 41.2 minuten langer, vergeleken met patiënten die een poli afspraak kregen (95%BI 35.3-46.6 min) en 49.9 minuten langer vergeleken met patiënten die voor verdere behandeling naar de huisarts gingen (95%BI 41.5-58.3 min). De verblijfsduur voor patiënten die opgenomen werden was ook 44.6 minuten langer, vergeleken met patiënten die geen verdere behandeling meer nodig hadden (95%BI 38.3-51.0 min). Er was geen verschil in wachttijd tussen SEHs met en zonder een spoedpost. Deze studie laat zien dat spoedposten van invloed zijn op SEH patiënt kenmerken en stromen, met oudere patiënten, meer verwezen patiënten en meer opnames, allemaal factoren

die geassocieerd zijn met een langere verblijfsduur op de SEH. Met 130 minuten is de mediane verblijfsduur echter relatief kort vergeleken met buitenlandse literatuur, waarin mediane tijden variërend van 176 tot 480 minuten worden beschreven. Hoewel een SEH met een spoedpost geen relatie had met de verblijfsduur, is het aannemelijk dat de goed georganiseerde huisartsenzorg van invloed is op de efficiëntie van SEHs in Nederland. De verblijfsduur op de SEH zou echter nog korter kunnen worden als de huisartsenzorg verder versterkt wordt, bijvoorbeeld door de mogelijkheid om ook buiten kantoor tijden röntgen- en laboratorium onderzoek aan te vragen en door samenwerking met keten brede richtlijnen voor zowel de huisarts als de SEH. Volgt er dan een verwijzing van de huisartsenpost naar de SEH dan is de kans op doublures minder en kan de wachttijd worden bekort door de reeds eerder verrichte diagnostiek.

In **hoofdstuk 7** presenteren we een retrospectief observationeel onderzoek. In Nederland werken steeds meer SEHs en huisartsenposten na kantoor tijd samen en vormen één voordeur voor spoedzorg (spoedpost). De spoedpost is met name ontstaan om zorgkosten te verminderen door de niet-urgente zelfverwijzer terug te redigeren van de SEH naar de eerstelijns huisartsenzorg. Op SEHs waar geen samenwerking is, kunnen deze zelfverwijzers de huisarts omzeilen en zich toch presenteren op de SEH. Dit impliceert een verschil in patiënt presentaties op SEHs met en zonder een spoedpost. Het doel van dit onderzoek was dan ook om het verschil voor ingangsklacht en ontslag diagnose tussen SEHs met en zonder spoedpost in kaart te brengen. Het onderzoek startte op 1 februari 2013 en betrof gegevens van 1800 patiënten, gelijk verspreid over zes SEHs, drie met en drie zonder spoedpost. De data bevatte tijd van presentatie, geslacht, leeftijd, ingangsklacht en ontslag diagnose, herkomst en vervolgroute.

Van patiënten op SEHs met een spoedpost was de gemiddelde leeftijd 47.8 jaar, was 74.7% verwezen en werd 45.2% opgenomen. Van patiënten op SEHs zonder spoedpost was de gemiddelde leeftijd 41.3 jaar, was 46.8% verwezen en werd 29.0% opgenomen ($P < 0.01$). Na het groeperen van vergelijkbare klachten hadden zowel patiënten op SEHs met een spoedpost als patiënten op SEHs zonder spoedpost dezelfde klachten prevalentie. Dit was respectievelijk trauma (25.7% versus 29.7%), buikpijn (12.1% versus 10.9%) en algemene symptomen (7.8% versus 4.8%) ($P = 0.07$). Na het groeperen van vergelijkbare ontslag diagnoses waren de drie meest voorkomende; fracturen en luxaties (10.8%), contusies en distorsies (10.4%) en luchtweg infecties (6.8%) voor SEHs met een spoedpost en fracturen en luxaties (10.7%), wonden (9.3%) en contusies en distorsies (8.9%) voor SEHs zonder een spoedpost ($P < 0.01$). Deze studie laat zien, dat ondanks dat er verschillen zijn in patiënt kenmerken en stromen er geen verschil is in ingangsklacht. Het lijkt dus niet zozeer dat de ingangsklacht, maar meer de patiënt kenmerken, zoals leeftijd en wel/ niet verwijzing, voorspellers zijn voor de ernst van de ziekte en eventueel ziekenhuis opname.

Hoofdstuk 8 bevat de algemene discussie van dit proefschrift, waarin we de hoofdbevindingen samenvatten en interpreteren. Spoedeisende hulp afdelingen in Nederland zien een dalend aantal patiënten per hoofd van de bevolking en deze hebben bovendien een kortere verblijfsduur vergeleken met andere westerse landen zoals de Verenigde Staten, Canada en het Verenigd Koninkrijk. De Nederlandse SEH patiënt is ook ouder, vaker verwezen en wordt vaker opgenomen. Als SEHs samenwerken met huisartsen posten en een spoedpost vormen, wordt dit verschil met andere westerse landen nog groter. Patiëntkenmerken en verwezen zijn door de huisarts, heeft een grotere voorspellende waarde voor een opname of polikliniek vervolg dan de ingangsklacht van de patiënt. Ondanks dat zowel de implementatie van de SEH-arts als de spoedpost een positief effect heeft op de spoedeisende geneeskunde in Nederland, is er ruimte voor verbetering. Als huisartsen op een spoedpost de mogelijkheid hebben om diagnostische onderzoeken (röntgen en laboratorium) aan te vragen zoals ze dat ook tijdens kantooruren hebben, zou dit kunnen leiden tot een verdere afname van SEH-bezoeken en dus een kortere verblijfsduur van patiënten die wel verwezen worden naar de SEH. Bovendien is het met een groeiend aantal SEH-artsen een kwestie van tijd tot deze 24/7 de SEHs bemannen. Dit verbetert de kwaliteit van zorg, niet alleen omdat er meer ervaren opgeleide dokters aan het bed staan, maar ook omdat dit bijdraagt aan betere implementatie van klinische audits, de ontwikkeling van spoedeisende geneeskunde richtlijnen en meer wetenschappelijk onderzoek binnen het domein van de spoedeisende geneeskunde.

Dankwoord

Het is zover. Mijn proefschrift is klaar en ondanks dat het af en toe moeilijk was om te combineren met andere werkzaamheden heb ik er ontzettend veel plezier aan beleefd. Maar het was me nooit gelukt zonder de hulp van vele lieve mensen. Ik wil alle spoedeisende hulp afdelingen en huisartsenposten die mee gewerkt hebben aan dit proefschrift bedanken.

Ook wil ik de manuscriptcommissie bedanken voor het beoordelen van mijn proefschrift.

Mijn promotiecommissie

Michel, ik ben je dankbaar dat je mijn promotor hebt willen zijn. Bij de start van onze samenwerking was dit niet vanzelfsprekend. Binnen IQ healthcare, was ik tenslotte een onbekende. Toch heb je naar mijn plannen en ambities geluisterd en ben je aan dit traject begonnen. Ik heb ontzettend veel van je geleerd, niet alleen het wetenschappelijke deel, maar ook het aanbrengen van structuur in mijn gedachten en ideeën. Ik mocht, samen met Paul, veel filosoferen over interessante dingen binnen de spoedzorg, maar er kwam altijd een moment waarop je vroeg waarom de wereld dit zou willen weten? En dat bracht me terug tot de kern van de onderzoeksvraag. Tijdens onze overlegmomenten was je niet alleen geïnteresseerd in de voortgang van het onderzoek, maar ook in mij persoonlijk. Ik ben dit promotietraject begonnen met het idee om er zoveel mogelijk van te leren. In mijn enthousiasme wilde ik alles wat maar betrekking had op mijn onderzoek helemaal zelf doen. Het gevolg was een drukke agenda die jij na elk overleg weer terug kon brengen naar een overzichtelijke actie lijst. Je waakte over mijn werkzaamheden en zorgde ervoor dat ik niet teveel hooi op mijn vork nam. Dank je.

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Mijn collega vakgroepleden

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IQ healthcare

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CHP zuidoost brabant

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Auteurs

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Mijn VIPs:

Last but not least.

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About the author

Wendy Thijssen was born on 13 april 1973 in Veldhoven. After graduating from the Anton van Duinkerkencollege in 1992, she started her medical study at the Radboud University in Nijmegen. She graduated in 1999 and started her first job in the neurosurgical department at the University Medical Centre in Utrecht. In 2000, she moved to the Catharina Hospital in Eindhoven to work as a non-trainee and in 2001 as a trainee in emergency medicine, under the supervision of Dr. Alexander van der Veen. She was a board member of the Netherlands Society of Emergency Physicians (NVSHA) from 2001-2004, the last three years as vice-president. During that time she was involved in the founding of the Society of Training in Emergency Medicine (SOSG). As the chairwoman of the training committee of the NVSHA, she participated in writing an emergency medicine training curriculum and implementing national and regional training days. In July 2004 she went to Adelaide Australia, to finish the last part of her training at Flinders Medical Centre under the supervision of Dr. Diane King. In April 2005 she returned to the Catharina Hospital to work as an emergency physician. From 2005 onwards she was part of the national visitation committee that supervises all emergency medicine traineeships in the country. Besides working as an emergency physician, she worked on this thesis from 2010 until 2014. In 2013 she became the assistant training director in emergency medicine at the Catharina Hospital. In 2014 she became training director, joined the concillium and in that same year she also joined the "taskforce revision Emergency Medicine curriculum", and the board of the Society of medical staff of the Catharina hospital.

Over de auteur

Wendy Thijssen is geboren op 13 april 1973 in Veldhoven. Na het behalen van haar VWO diploma aan het Anton van Duinkerkencollege, startte ze in 1992 haar geneeskunde opleiding aan de Radboud universiteit in Nijmegen. Ze behaalde haar arts-examen in 1999 en ging werken als AGNIO neurochirurgie in het Universitair Medisch Centrum Utrecht. In 2000 ging ze werken in het Catharina ziekenhuis in Eindhoven, eerst als AGNIO, en in 2001 als AGIO spoedeisende geneeskunde onder de supervisie van Dr. Alexander van der Veen. Daarnaast was ze van 2001-2004 lid van het bestuur van de Nederlandse Vereniging van Spoedeisende Hulp Artsen (NVSHA) waarvan de laatste 3 jaar als vice-voorzitter. Gedurende die periode was ze nauw betrokken bij de oprichting van de Stichting Opleiding Spoedeisende Geneeskunde (SOSG). Als voorzitter van de NVSHA opleidingscommissie, was ze tevens betrokken bij de totstandkoming van het curriculum voor de opleiding spoedeisende geneeskunde en de landelijke- en regionale

onderwijsdagen. In juli 2004 maakte ze het laatste deel van haar opleiding af in Flinders Medical Centre in Adelaide, Australië onder leiding van Dr. Diane King. Ze keerde in april 2005 terug naar het Catharina ziekenhuis om als SEH-arts aan de slag te gaan. Sinds 2005 is ze ook weer actief binnen de NVSHA, als lid van de plenaire visitatie commissie. Naast deze werkzaamheden heeft ze van 2010-2014 gewerkt aan haar proefschrift. In 2013 is ze plaatsvervangend opleider spoedeisende geneeskunde. Sinds 2014 is ze opleider spoedeisende geneeskunde geworden in het Catharina ziekenhuis en toegetreden tot het concilium. In datzelfde jaar heeft ze zitting genomen in de "werkgroep herziening curriculum NVSHA" en het stafbestuur van de vereniging medische staf van het Catharina ziekenhuis.

Personal note

The cover of this thesis is full of personal photo's that I want to share.

Front cover

On the front cover is a photo of the mountain Sgùrr na Lapaich (meaning 'peak of the bog' in Scottish Gaelic, 1036 m) situated in Glen Affric, Scotland. To me, this mountain is also known as the 'no way hill'. It describes the feeling I had, when I was just below the summit and felt that I could not continue anymore. Eventually I did manage to reach the top and it turned out not to be as difficult as I thought. Throughout the sometimes challenging moments of my thesis, this mountain has been my inspiration. If you really want something, work for it and you will get it.

Op de voorpagina van dit proefschrift staat een afbeelding met daarop het uitzicht op de berg Sgùrr na Lapaich (1036 m) wat 'peak of the bog' betekent in Schots Gaelic. De foto is genomen in Glen Affric, Schotland. Deze berg is bij mij ook bekend als de 'no way hill'. Dit beschrijft het gevoel dat ik had toen ik net onder de top van deze berg was, en het gevoel had dat ik niet meer verder kon. Uiteindelijk heb ik toch de top bereikt en viel het allemaal erg mee. Tijdens de moeilijke momenten van mijn promotietraject is deze berg een morele steun voor mij geweest. Als je iets echt graag wilt, moet je ervoor werken en dan kun je het ook bereiken.

Back cover (top to bottom)

The back of this book is full of photo's of places in Scotland that I have visited over the last few years. These places let you escape from every day life. Moments without wifi or phone signal, ideal to relax and recharge.

Op de achterkant van dit proefschrift staan foto's van plekken in Schotland, waar ik de afgelopen jaren ben geweest. Plekken waar je nog kunt ontsnappen aan de waan van de dag, zonder wifi of telefoonbereik. Ideaal om jezelf weer op te laden.

View from Stac Pollaidh, Assynt
Cliffs of Reiff, Assynt
Summit of Ben MacDui, the Cairngorm Mountains
Duncansby Head, Caithness
Puffin, Isle of May
Climbing at the Hawkcraig, Fife
Sgùrr na Lapaich, Glen Affric
The Lochs of Assynt
Cairngorm Mountains, Northern Cairngorms

"Waar een wil is, is een weg"

